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By JOHN A. RYLE, M.D. Lond., F.R.C.P.

REGIUS PROFESSOR OF PHYSIC IN THE UNIVERSITY OF CAMBRIDGE; CONSULTING PHYSICIAN TO GUY'S HOSPITAL

SINCE the group of ideas which suggested the topic of this address could not well be condensed within an easy headline I have had to fall back upon an uneasy word, but one whose meaning, at least, should be beyond dispute. The ideas are as follows:—

(1) We have come to recognise that bacteria enter the circulation much more readily and in many more circumstances than was formerly supposed.

(2) This knowledge has had an important influence upon our recognition or understanding of many diseases whose natural history and diagnosis would otherwise have lacked completion.

(3) The demonstration of hæmic infections by blood culture has been insufficiently utilised.

(4) The nomenclature of the hæmic infections is unsatisfactory or at least requires review.

(5) Hæmic infections may be clinically very innocent, moderately anxious, or very serious, and the differentiation of these varieties for purposes of prognosis and treatment is not always clearly made.

(6) The introduction of new and potent chemotherapeutic agents provides a special reason for a general revision of our attitude to the blood-stream infections as a whole. Thus, whereas we have had to content ourselves hitherto with the treatment of primary foci and secondary lesions and with general symptomatic measures and have remained at a loss for a method of treating the systemic disease, the possibility of a rapid sterilisation in vivo—previously only achieved in certain protozoal diseases—is now in prospect, and the mortality and morbidity of certain grave infections are already on the wane.

(7) These new discoveries have provided an additional reason for close coöperation between medicine, pathology, and chemistry.

It is well known that bacteriæmia is an essential part or an occasional accident of many infections. Thus of typhoid fever it is an essential part; in gonorrhœa and tuberculosis it is an occasional, but probably not extremely rare, accident. What is the evidence that other bacteria enter the blood stream more readily than was formerly supposed?

STAPHYLOCOCCUS AUREUS

For a long time (although it was clear that this could not actually be the case) osteomyelitis, perinephric abscess, and some other staphylococcal lesions were considered and handled as though they were local diseases. The teaching which I received on these conditions as a student included little or no reference to the total natural history of the disease, to the primary focus, the pathways of infection, and the possibility (except in septicæmic cases) of coexistent foci elsewhere in the body. The teaching of the post-mortem room showed that in fatal staphylococcal septicæmia bone, kidney, lung, and heart were among the selected sites for metastatic infection.

Clinical study reveals the existence of a primary focus in the shape of a boil, carbuncle, or infected abrasion in more than three-quarters of cases of remote and deeply seated staphylococcal infections. Perinephritis has been shown to represent a spread of infection from a metastatic cortical abscess (or "renal carbuncle") which has perforated the kidney capsule. Clinical study has also shown that osteomyelitis and renal and prostatic abscesses may and often do develop without any intervening septicæmic illness. In other words, as these tissues can only have been reached by the blood stream, a relatively benign bacteriæmia must have occurred, although by the time this fact is manifest it is usually too late to obtain a positive blood culture. In all probability the bacteriæmia in such cases is but a transitory affair.

Staphylococcal bacteriæmia is clearly far more common than can be concluded from the total of cases presenting with a septicæmia or a metastatic focus. Many patients with recurring furunculosis must pass through unrecognised phases of transient hæmic infection, and obscure fevers can sometimes be shown to be due to this cause, as witness the following case.

A man aged 45, who was said to have had an injury to the right kidney in the war and, ten years previously, had made a good recovery from a lung abscess following tonsillectomy, was then quite well until Oct. 24th, 1937. That evening after a cold walk he felt chilly and had a temperature of 101° F. Next day he had a temperature of 103° F. with very bad headache and chills and pain in the left abdomen and loin. Tenderness was noted in the left renal angle. On the 26th there was a leucocytosis of 20,000 cells per c.mm.; urine was normal; blood culture negative, but a few cocci were seen in films included within some of the leucocytes. Intense headaches, epistaxis, further chills, and profuse sweats were the chief features of the next few days. I saw him in consultation with Dr. Gilbert Gray and Dr. C. H. Whittle on the 29th. There were no signs of meningitis; pulse-rate throughout remained in the seventies; no localising signs apart from a doubtful friction at the right axillary base. I found the scar in the left axilla of a small boil which had appeared three weeks previously and suggested a diagnosis of staphylococcal bacteriæmia. He remained a very sick man and sweats continued. On the 31st he was much troubled by visual hallucinations and had an extreme injection of the sclerotics. There was abdominal distension which was relieved by pituitrin. By Nov. 2nd the injection of the sclerotics was even more pronounced and there was a transitory œdema of the left eyelid. The pulse-rate remained slow and there was general improvement. On Nov. 7th there was again definite localised pain in the left loin with deep tenderness over the last rib. A second blood culture (taken on Oct. 29th) grew *Staphylococcus aureus* on Nov. 3rd. The patient made a steady recovery, the temperature falling gradually to normal by Nov. 11th. On the 28th the leucocyte count had fallen to 12,000. He went for a sea-trip and has since remained perfectly well.

What might be described as "abortive localisations" are a distinctive feature of some cases of staphylococcal bacteriæmia. In this case we were anticipating a left perinephritis or a cerebral localisation or both. It is probable that there were small abscesses with spontaneous healing in one at least of these situations.

Without the boil, the chills, the attempted localisations, the leucocytosis, and the recognition of cocci within white cells in a blood film the delayed positive blood culture might have been attributed to contamination with a common skin organism. The combined clinical and pathological evidence leaves no reasonable doubt that the fever was, in fact, an accompaniment or sequel of a staphylococcal

* Inaugural address to the Nottingham Medico-Chirurgical Society, Oct. 5th, 1938.

bacteriæmia. The clinical picture, with slow pulse-rate throughout and absence of developed metastases, scarcely deserved the label of septicæmia.

PNEUMOCOCCUS

Lobar pneumonia was formerly regarded as a local disease. Bacteriological studies, chiefly dating from the recognition of the various types and sub-types of the organism, from animal experiment and from the introduction of protective sera, have shown that pneumococci may be grown from the blood in a considerable proportion of cases in the early stages of the disease, and in a smaller proportion (usually carrying a bad prognosis) throughout its course. Whether the blood-stream invasion more commonly precedes, accompanies, or succeeds the pulmonary infection in man has not been certainly shown, but we can now say that lobar pneumonia is often associated with and sometimes adversely complicated by a bacteriæmia. The initial chill or rigor probably bears a temporal relationship with the arrival of organisms in the circulating blood. Before the days of blood culture a hæmic infection could be inferred in only a few cases complicated by meningitis, peritonitis, and arthritis—all local inflammations which could only have resulted in this way. The frequency of pneumococcal bacteriæmia and the fact that it is not necessarily adverse have only been revealed by systematic blood cultures.

MENINGOCOCCUS

Unless it be assumed that the meningococcus has made a direct entrance to the cranial cavity by way of the nasopharynx and accessory sinuses or via the perineural sheaths, it must be argued that the meninges are also invaded from the blood. The dramatic suddenness of the disease in many cases, the petechial rash, which has been accepted as evidence of generalised infection in other bacterial diseases, and the occasional complication by arthritis and pericarditis all indicate that the meningococcus too spends or may spend some part of its time in the circulating blood. It has in fact been grown from the blood and even demonstrated in a blood film, but as the majority of cases present symptoms of meningitis from an early stage it is reasonable and customary to examine the cerebro-spinal fluid rather than the blood. Occasionally a prolonged meningococcæmia precedes or occurs without a meningitis.

A young university athlete developed a sore-throat after bathing and sun-bathing in September, 1933. With the exception of a few days during which his temperature was about normal, he was then febrile for three weeks, with evening temperatures rising to 102° F. and 103° F., frequent sweats, and repeated crops of erythematous spots and petechial hæmorrhages. In the second week blood cultures and agglutinations against the typhoid group of organisms were negative. He was given three injections of antiscarlatinal serum on the supposition that the infection was streptococcal. I saw him with Dr. Leonard Leslie of Streatley at the end of the third week. He did not look seriously ill and between the pyrexial peaks felt well. The spleen was just palpable. Petechiæ on the palate and conjunctiva. There were no murmurs, clubbing of the fingers, or albuminuria, but I could not help reviewing the possibility of bacterial endocarditis. There was neither headache nor neck rigidity. Next day, however, he had intense headache. A little later lumbar puncture gave turbid fluid under pressure and meningococci were seen in direct examination and obtained on culture. He was treated with repeated lumbar puncture and serum, but later developed a thecal block. Dr. C. P. Symonds and Mr. J. L. Joyce continued the treatment, employing cisterna punctures, and he made a complete recovery. Although the organisms were not recovered from the blood, there can be no reasonable doubt that this was a case of prolonged meningococcal bacteriæmia preceding the meningitis. To-day, with earlier diagnosis and sulphanilamide, it is possible that the meningitis with its attendant complications and risks might have been avoided.

BACILLUS COLI COMMUNIS

For the most part infections with *B. coli* have been regarded as local events—the bladder, the renal pelvis, and the gall-bladder being the common sites of inflammation. Orchitis may also complicate the urinary tract infections. Much discussion has centred around the possible paths of spread from the bowel, which has been generally accepted as the source of the organisms. Direct urethral ascent of infection in women and girls has had its advocates. Ascent to the kidney has been thought by some to be by way of the peri-ureteric lymphatics. Trans-peritoneal infection from the colon to the kidney has also been mooted but has always seemed improbable. The clinical onset of pyelitis with general malaise, headache, and rigors (the urinary symptoms commonly developing later), and the occasional simultaneous or subsequent infection of other organs, strongly suggest an initial blood-stream invasion. Blood cultures are, however, but rarely performed. Bacillæmia has been recorded by Panton and Tidy (1912) and by Kidd (1920) during or near the stage of rigor, but their cases were not uncomplicated cases of pyelitis. Barrington and Wright (1930) demonstrated bacillæmia, with or without rigors, after operations on the urethra.

B. coli *bacteriæmia with impacted ureteric calculus.*—A nervous and highly strung married woman, aged 35, was referred to me by the late Mr. Frank Kidd, under whose care she had been for pyelitis, on account of symptoms referable to her colon. She was liable to spasmodic bowel pain and sudden "chills." On June 1st, 1930, 18 months later, she was wakened by bad pain in the lower part of her back, became ill and pyrexial, and complained of pain and frequency. The pain moved to the left side, she had frequent rigors, and her temperature rose to 106° F. and later 107° F. The onset of illness coincided with a menstrual period. I saw her in consultation with the late Dr. P. W. James on June 11th. She was mentally strange, in a typhoidal state, twitching, incontinent, and drowsy. The abdomen was soft and flaccid. She was tender in both flanks. She was passing plenty of urine. The leucocyte count was 17,300 per c.mm., with 90 per cent. polymorphs. Blood culture gave a pure growth of colon bacillus. On the 14th Mr. Kidd drained the pelvis of the left kidney which was full of foul pus. At a later operation he removed a stone from the ureter, and she made a good recovery.

From clinical inference and the work of Barrington and Wright it seems probable that a bacillæmia may result from a variety of small accidents and that the onset of an initial attack of pyelitis is preceded by a transitory bacillæmia. From cases like the foregoing it would appear that it requires obstruction to free drainage by the kidney and ureter to convert a transitory into a more sustained and serious bacillæmia. It may be inferred that in pyelitis uncomplicated by obstruction the bacillæmia ends when the urinary infection begins.

STREPTOCOCCUS VIRIDANS

This organism, having its abode in the mouth and particularly in the tooth-sockets, is the commonest one found in the blood stream in cases of subacute bacterial endocarditis. The accident of a bacteriæmia

in a subject with damaged or anatomically abnormal valves determines the disease. Lewis (1934) concludes that 23 per cent. of subjects having bicuspid aortic valves and arriving at adult life acquire bacterial endocarditis and that therefore at least this proportion of adults incurs at some time a bacteriæmia with *S. viridans*. The natural resistance to the organism, however, is high and only those whose valves supply easy lodgment succumb to the disease. Bacterial endocarditis following dental extractions has frequently been recorded, and this occurred in 3 out of 21 cases in my own private series.

A very interesting and important investigation by Okell and Elliott (1935) has shown how slight a trauma may drive organisms from the dental sockets into the blood stream. Within a few minutes of the extraction of teeth from a septic mouth a transient streptococcal bacteriæmia was demonstrated in 75 per cent. of cases. Even where there was no obvious gum disease a transient bacteriæmia followed in 34 per cent. Of 110 patients with septic mouths 10·9 per cent. were found to have a streptococcal bacteriæmia irrespective of operative interference. Dr. Elliott (private communication) tells me that manipulation of or biting upon a tooth in an infected socket may give rise to a bacteriæmia. He has also shown that a transitory bacteriæmia may follow tonsillectomy.

A bacteriæmia produced in these ways clearly represents little more than an accidental seepage of organisms into the circulation, but if such an innocent seepage can and often does happen in certain conditions, we must allow that the more remote possibility of a dangerous bacteriæmia exists in the same conditions. An explanation is also provided for some of the so-called cryptic septicæmias due to the more dangerous streptococci of the pyogenes group, and seemingly trivial origins of general sepsis must clearly now be sought and studied with greater care by clinicians.

Need for Collaborative Study

There is thus, it would seem, need for much further inquiry into the frequency of bacteriæmia in association with lesions hitherto regarded as local, and into those factors which convert an innocent and transient bacteriæmia into a grave and sustained septicæmia. Is it a question of dosage of organisms, of virulence or viability, or of reinvasions from secondary foci? What factors influence the resistance of the host? Do organisms ever multiply in the blood stream? If not, whence are derived the organisms giving rise to the countless colonies which can be grown from a small volume of blood during the early stages of a septicæmia due to *S. pyogenes* and following so insignificant an injury as a needle-prick or a gnat-bite? What is the time relationship of invasion to the first fever or to the rigor? What is the significance of a rigor?

Okell and Elliott (1935) showed that there was no close association of pyrexia with the time at which organisms could be recovered from the blood. In 14 out of 20 patients fever followed from four to nine hours after the dental extraction and lasted from two to four hours, but blood cultures, positive soon after the extractions in a few cases, were no longer positive at the time of the fever. Probably many of us have noticed a slight temporary malaise a few hours after a dental extraction. Barrington and Wright (1930) investigating catheter fever showed a comparable time relationship between trauma, bacteriæmia, and pyrexia.

It may well be that the old plan of taking blood cultures in the immediate neighbourhood of a pyrexial peak in suspected septicæmia or bacterial endocarditis was unsound and that the chances of a positive growth would be better some hours earlier.

These are some of the points calling for closer investigation. They will only be solved by a much more intimate association than is usual between the clinical and the laboratory worker. Even in the teaching hospitals it is comparatively rare for the physician or surgeon and the pathologist to see their cases together. The habit of employing forms and requisitions and reports in place of consultations is one of the least satisfactory by-products of specialised medicine.

The importance of the older clinical and more recent laboratory observations to which I have referred can scarcely be denied. Diseases frequently treated in the past as local must be viewed and treated as stages only, or possible stages, in the course of a general disease. Local primary lesions such as furuncles and carbuncles and secondary lesions such as osteomyelitis and the renal carbuncle are all capable of liberating organisms which may undergo general dissemination. Rough or untimely surgical handling will increase the liability to such dissemination, which in turn may be transitory and benign or prolonged and grave in its effects. So simple a procedure as a dental extraction can be a dangerous undertaking in persons with valvular abnormalities, but it would also appear that retention of a tooth in an infected socket with a liability to small and repeated natural traumata carries a similar risk. A specific risk of the bad practice of wholesale dental extractions which has long been condemned by physicians is now proclaimed. Apart from the organisms mentioned even the pyogenic streptococci, more commonly associated with a fulminating septicæmia, may sometimes cause a relatively benign bacteriæmia.

A man aged 64 injured his left leg while hunting. A hæmatoma became infected and led to a cellulitis and lymphangitis. He would not rest properly. A fortnight later he became generally ill, vomited, and had a solitary rigor. His temperature ranged between 102° F. and 103° F. Cultures from the blood grew streptococci. There was a leucocytosis of 19,300 cells per c.mm. No further rigors ensued; there was no splenic enlargement or diarrhœa. The pulse-rate did not exceed 80. I was asked to advise as to whether he should be given serum. The clinical picture was not that of a septicæmia but of a transitory bacteriæmia due to local sepsis, and I advised against specific therapy. He made a good recovery.

Tubercle bacilli, which must reach the joints and other remote parts via the blood stream, may also be widely disseminated and give rise to a chronic miliary infection of the viscera—a condition which is not necessarily fatal (Hoyle and Vaizey 1937, Hickling 1938). There are, in fact, few pathogenic organisms which do not at times enter the circulation.

Value of Blood Cultures

The value of blood cultures has, perhaps, been sufficiently demonstrated already. In hospital a much greater proportion of obscure and post-operative fevers might be examined in this way. In consulting practice I have been struck by the comparative infrequency with which the idea of a blood culture seems to have suggested itself in cases both of obscure fever and evident septicæmia. In suspected typhoid fever it still seems quite usual to wait for agglutination tests until the tenth day or later notwithstanding that an earlier and more accurate diagnosis can often be achieved by the more direct method. My own schooling and close association with a mobile

laboratory during the war period may have been responsible for personal interest, but the experience also brought conviction as to the scope and utility of the practice. The fact that cultures are often negative and that they may be negative even in some cases and at some stages of an undoubted septicæmia should be no deterrent, for the same fallibility attaches to other specific and invaluable laboratory tests.

The readiness with which blood cultures are obtainable varies considerably with the organism. The technique varies in different laboratories and for different infections and for this reason an indication of probability must always be given to the coöperating pathologist and preferably a consultation should be arranged with him. The ease with which organisms are grown, the number of colonies from a given volume of blood, and the continuance of positive cultures may have a bearing on the gravity of an infection, but this must, in fact, be gauged at present by clinical rather than by laboratory judgment.

INDICATIONS

A blood culture should ideally be performed as early as possible in every case of suspected typhoid fever, or of staphylococcal or streptococcal septicæmia; in any case in which the possibility of a bacterial endocarditis is entertained; in any case presenting rigors; and in any sustained or intermittent continued fever for which no adequate local or non-bacterial cause can be discovered. In hospital practice (where the laboratory service permits) routine blood cultures might be employed with advantage to prognosis, treatment, and general knowledge in all cases of significant post-operative and puerperal fever and in lobar pneumonia. In cases of proved bacteriæmia a repetition of blood cultivations and colony counts at appropriate intervals may be found to give useful information in regard to the progress of the disease and assist the study of the effects of chemotherapeutic agents.

Nomenclature

The terms bacteriæmia, septicæmia, pyæmia, and sapræmia are all in current use and it is desirable that their meaning should be more accurately appraised.

By *bacteriæmia* we should imply nothing more nor less than the presence of organisms in the blood. It is a pathological finding rather than a clinical state. It may or may not cause symptoms.

Septicæmia is a clinical state characterised by fever, rigors, a tendency to metastatic lesions, and other well-known manifestations of general infection, and carrying a grave prognosis in a high proportion of cases. It is due to but not synonymous with a bacteriæmia which can occur in the absence of septicæmic symptoms. A non-septicæmic bacteriæmia can nevertheless often be inferred from clinical antecedents and sequelæ. Although other specific types of bacteriæmia—e.g., meningococcal and pneumococcal—may be complicated by rigor and metastatic infection the term septicæmia should strictly be reserved for infections with streptococci and staphylococci.

Pyæmia is another name for a septicæmia with pyogenic organisms and complicated by evident purulent metastases. Its use might well be discontinued.

Sapræmia is used to describe the fever and malaise which are associated with a localised infection, such as a puerperal endometritis. The symptoms are presumed to be due to the absorption of bacterial toxins rather than of organisms into the circulation. It is not improbable that routine blood cultures would sometimes show organisms in the blood. The absence of metastatic foci and the improvement which follows appropriate local treatment distinguish the condition from a septicæmia. The local condition is clearly the important factor in the disease, and so it would seem that in concert with pyæmia the term sapræmia might be discarded without inconvenience.

Terminology thus becomes simplified, for we are left, in the case of the septic organisms, with three clinical expressions of a bacteriæmia—the septicæmic and the non-septicæmic and bacterial endocarditis. The differentiation of these types is in the main clinical. The main pathological features of the non-septicæmic variety of bacteriæmia are the transitory nature of the blood-stream invasions and the rarity of multiple metastases.

Prognosis

Since a bacteriæmia may be entirely innocent (as in those instances which follow a dental extraction and other small accidental circumstances which often pass unrecognised), or may be a cause of a transitory malaise and fever, or of a more serious fever with or without distant metastatic localisations, or of a grave or fatal septicæmia, it is clearly necessary that we should be able to separate the benign from the graver forms whenever we are confronted with a positive blood culture. In many cases of bacteriæmia there will be no sufficient clinical indication for the performance of a blood culture at a time when it might prove positive. With such cases our chief concern is the necessity for recognising that they exist. In other febrile cases we shall obtain a large proportion of negative and a small proportion of positive cultures. With an increase in the frequency of blood cultures, however, we shall need to acquire judgment in regard to the import of positive findings.

A bacteriæmia is merely a pathological finding and does not inform us about the state of activity of the disease from which the patient is suffering. A profuse and early growth of a septic organism may suggest a graver infection than a scant and tardy growth, but there is no reliable numerical assessment of prognosis along these lines, for a patient with a profuse growth may recover while a positive culture is not obtainable at all times even in patients with an undoubted and fatal septicæmia. *S. viridans* may be grown with the same ease (or difficulty) after an innocuous dental extraction as in a case of subacute bacterial endocarditis.

The clinical facts of the disease can, on the other hand, give us valuable and often reliable information as to the state of the contest between the patient's defence mechanisms and the invading host. Tables I and II give some of the essential findings in groups of septicæmic and non-septicæmic cases of staphylococcal bacteriæmia respectively. Absence of rigors or an initial rigor only, a pulse-rate slow in proportion to the temperature (often not exceeding 70 or 80 to the minute), abortive foci or a single secondary focus, and the relatively easy demeanour of the patient will generally place him in the benign group, in which deaths are rare, even though his illness be long and his osteomyelitis or perinephritis may call for watchful care and difficult judgments and keep him bedridden for many weeks. Repeated rigors, a rapid pulse-rate, and an anxious demeanour or delirium, with multiple secondary foci place him in the septicæmic category in which the mortality is upwards of 50 per cent. In the benign group the opportunity for a blood culture has often passed by the time the nature of the secondary focus or the cause of the fever has been recognised. In the grave group the indications for it should be obvious and

TABLE I—STAPHYLOCOCCAL BACTERIÆMIA

Age.	Sex.	Primary lesion.	Metastatic lesions.	Blood culture.	Result.
40	M.	Calculous pyonephrosis.	Cervical vertebra.	0	Recovery.
42	M.	Boils.	Kidney.	0	Recovery.
45	M.	Boil.	Kidney.	+	Recovery.
16	F.	Boil.	Left tarsus, right tibia.	+	Recovery.
33	M.	Carbuncle.	Lung, right kidney (1926), left kidney (1930).	−	Recovery.
25	M.	Boils.	Kidney.	0	Recovery.
63	M.	Cut finger.	Lung, prostate.	0	Recovery.
35	M.	Blister on foot.	Kidney.	0	Recovery.
20	M.	Boils.	Kidney.	0	Recovery.
26	M.	Boils.	Kidney.	0	Recovery.
30	M.	Boils.	Lung.	0	Not traced.
9	M.	Boil.	Kidney.	−	Recovery.

TABLE II—STAPHYLOCOCCAL SEPTICÆMIA

58	M.	Boil.	Cervical vertebra.	0	Death.
23	M.	Self-inflicted abrasions.	Lungs.	+	Death.
13	M.	Boils.	Skull, lung, liver.	+	Death.
18	M.	? a picked wart.	Kidney, lung, bones.	+	Death.
34	M.	Carbuncle, boils, stye.	Lungs.	+	Recovery.
16	M.	?	Lung, femur.	+	Recovery.
32	M.	Boil.	Lungs, kidney, skin.	+	Recovery.
35	M.	Boil.	Kidney, lung, brain.	−	Death.
19	M.	Carbuncle.	Muscle, skin, lung.	+	Recovery.
25	F.	Boil.	Meninges, heart.	0	Death.
28	M.	?	Lung.	+	Recovery.
46	M.	Carbuncle.	Lung, prostate, muscle.	0	Death.

+ = positive; − = negative; 0 = not performed.

positive cultures are obtained in a high percentage of cases.

Chemotherapy

The introduction of sulphanilamide and its compounds may prove to be one of the most important therapeutic advances of the present century. For long it had seemed that no direct chemical answer would be forthcoming for the bacterial infections, notwithstanding that the protozoal and spirochætal diseases had been treated with an increasing measure of success with quinine, antimony, emetine, mercury, arsenic, or bismuth. Reports on the efficacy of sulphanilamide, both in human infection and animal experiment, continue to accumulate and the list of organisms for which it and related compounds have a lethal effect has steadily grown.

Although it has certain well-recognised toxic effects these would appear to be no greater than those of the metallic agents in common use for syphilis. The risks that are chiefly to be anticipated are from its injudicious and indiscriminate use. It may be confidently predicted that it will be given in many conditions for which it is not appropriate and in many fevers whose cause has not been established. At present its use is especially justified in streptococcal septicæmia of puerperal or other origin; in non-septicæmic puerperal fever and other localised streptococcal infections, including erysipelas and meningitis; in meningococcal infections; in *B. coli* pyelitis; and in gonococcal and pneumococcal infections. In all of these there is or may be a bacteriæmic phase. It is of some importance both to the patient and to the evaluation of the treatment that we should know whether we are treating a relatively benign bacteriæmic fever likely to undergo spontaneous recovery or a grave septicæmia. Closer inquiry into the mode of action of sulphanilamide on bacteria in vivo will also be necessary. The information required can only be obtained by intimate clinical and bacteriological coöperation and particularly by well-planned research programmes in different centres, programmes for which Colebrook and his collaborators have provided a pattern in their important studies of puerperal sepsis.

Conclusion

I have sought to emphasise first, that a bacteriæmia, deriving often from trivial causes or alternatively accompanying a serious local infection, is more common than has been generally appreciated; secondly, that bacteriæmia and septicæmia are not synonymous terms; thirdly, that separation (for purposes of prognosis and treatment and enhanced pathological knowledge) of the septicæmic and non-septicæmic bacteriæmias is important; fourthly, that for this purpose a closer coöperation between the clinicians and the pathologists is needed; fifthly, that the introduction of a new and promising chemotherapy has made it necessary for us to acquire a better understanding of the natural history and mode of spread of bacterial infection in the body fluids.

We may well be on the eve of a collaboration in which the physician and the surgeon, the bacteriologist and the chemist will make contributions of the greatest importance to medicine. The separation of the laboratory worker from the clinical worker in the past has had effects which we must all deplore. The therapeutic vaccine craze was a particular example of medicine gone astray partly in consequence of this separatist policy. Bacteriologists assumed the rôle of therapeutists, and with little or no reference to or knowledge or study of their patients, sometimes even without seeing them, prescribed treatments which many clinicians were content to accept and employ, often without establishing a true diagnosis and without a critical consideration either of the method or its results. We must not allow such widespread perversions of judgment to prevail again. A promising chemotherapy must not be allowed to acquire discredit through uncontrolled and indiscriminate use.

My plea is that the physician, the pathologist, and the chemist should in future share their problems with an intimacy which has hitherto been lacking and that the germs of disease should be studied anew in their human environment and so be permitted to become the germs of new ideas.

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THE TREATMENT OF ANKLE FRACTURES

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In recent years great advances have been made in the treatment of ankle fractures. The skin-tight walking plaster cast has swept the time-honoured box splint from the wards to the surgical museum, and transferred patients from the hospital to their own homes. The results of the change have been so satisfactory that one hesitates to suggest further improvement. I think, however, that "minor" and "major" ankle fractures are insufficiently differentiated, and too often a "minor" ankle fracture suffers from treatment which is neither necessary nor advantageous. In this paper I wish to describe the method I adopt in treating these "minor" fractures.

VARIETIES OF ANKLE FRACTURE

In 1923 Ashurst and Bromer introduced a rational classification of ankle fractures, based on the type of force causing the break. Thus torsion, abduction, adduction, and compression fractures are described, and in addition there are degrees of these fractures which depend on the force of injury sustained.

Torsion fractures of the 1st degree show an oblique spiral fracture of the lower end of the fibula (Fig. 1). If the violence is more severe, lateral rotation of the foot occurs and, as the foot displaces outwards, the medial malleolus is sheered off, or the internal lateral ligament is torn. This is a 2nd degree fracture. If still more force is applied the foot swings out and back, and the astragalus, impinging on the posterior articular surface of the tibia, breaks a wedge-shaped segment from this articular surface, in addition to the fractures of the lateral and medial malleoli. The foot is rotated out, displaced out, and displaced backward, giving what is termed a 3rd degree fracture.

Torsion fractures account for some 70 per cent. of cases, and are caused by the same mechanism as tears of the medial meniscus, and subcapital fractures of the neck of the femur in the aged.

Abduction fractures make up about 15 per cent. of the cases. Here the foot is abnormally everted at the ankle-joint. In 1st degree fractures the medial malleolus is pulled from the tibia and the fracture line is transverse (cf. adduction fractures). When this has taken place, and not before, further abduction of the foot causes a sheering of the lower end of the fibula. The line of fracture is slightly oblique but is quite unlike the line of a torsion fracture. The foot is displaced outwards, and the fracture is known as 2nd degree. In some 2nd degree abduction fractures instead of avulsion of the medial malleolus the internal lateral ligament of the ankle tears. This is still an abduction 2nd degree fracture, but X ray films do not reveal the diagnosis of this type.

Adduction injuries account for some 10 per cent. of ankle fractures. Here the foot is forcibly inverted at the ankle-joint. In 1st degree fractures the lateral ligament of the ankle is torn, or else the tip of the lateral malleolus is avulsed. If the foot is now further inverted, the medial malleolus is sheered off obliquely, and a 2nd degree fracture results.

Compression fractures comprise a mixed group with which I am not at present concerned.

Ashurst and Bromer's views can readily be proved correct by careful clinical and radiographic examination of ankle fractures, and by careful investigation of the history of the cases. After clinical and X ray examination one is soon able to tell a patient exactly how he broke his ankle.

MAJOR AND MINOR FRACTURES

It will be noticed that in all 1st degree fractures only one side of the joint is involved. In all 2nd and 3rd degree cases both sides are involved. Those fractures with injury of both sides I call "major fractures." I refer to fractures where only one side of the joint is involved as "minor" fractures, for I believe that such fractures are invariably stable and require no form of splint in their treatment.

A short time ago I was consulted by a lady complaining of slight weakness of the ankle. She could walk long distances, but some times at night her foot felt a little tired. She told me that twenty years ago a "piece of bone was put into my foot," and a scar over the lower end of the outer aspect of the leg showed that some operative procedure had been undertaken. Clinically nothing else could be seen (Fig. 2). A radiogram showed that the lowest 5 in. of the fibula had been resected. In spite of this, for twenty years the ankle had been stable and had shown no tendency to any displacement. Moreover we constantly see "missed" ankle fractures which have been bearing weight without splints for days or weeks without any displacement.

Hence I regard these fractures as stable.

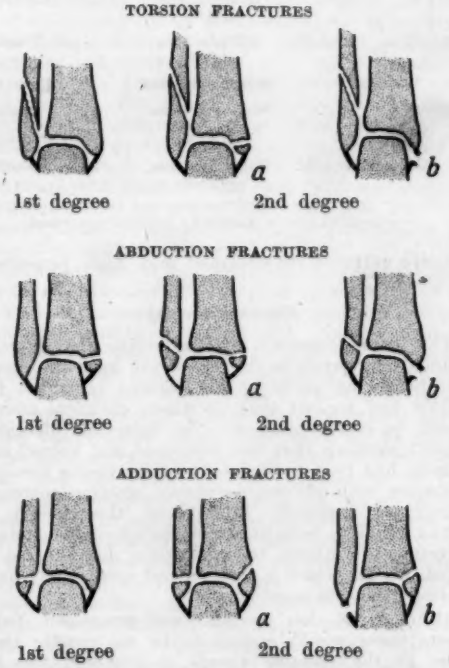

FIG. 1.—Diagram showing the various types of 1st and 2nd degree ankle injuries. It illustrates the need for clinical differentiation of 1st degree injuries from 2nd degree (*b*) cases, in which both lateral stabilisers are injured, though the damage done to them is not shown by X rays.

TREATMENT OF MINOR FRACTURES

During the past three years I have been able to confirm (Campbell 1938) the results claimed by Leriche (1928 and 1936) in the treatment of various soft-tissue injuries by injection of procaine. This permanently relieves pain and restores function in all manner of soft-tissue injuries. I was led however, by an accidental observation, to use similar injections in the treatment of ankle fractures.

FIG. 2.—Radiogram taken twenty years after resection of 5 in. of fibula. The ankle had remained stable.

In November, 1936, I attempted to use Böhler's procaine anæsthesia in order to reduce a 3rd degree torsion fracture. For some reason anæsthesia was inadequate, and I completed the case using general anæsthesia. Three days later, the position being imperfect, the plaster was removed. The fracture was found to be insensitive, and there was no muscle spasm. The fracture was reduced and plastered without any other anæsthetic.

A few days later a man, aged 75, reported ten days after an injury and was found to have a 1st degree torsion fracture on which he had been walking. He had some pain and was limping badly. The fracture was injected with procaine and he resumed work the next day. He had no more pain, and the fracture united in normal time.

Since then I have adopted this method of treatment in all 1st degree ankle fractures. Many other types of fracture have also been found suitable for the method; phalangeal fractures, Jones's fracture of the fifth metatarsal, contusion fractures of the humeral head (Fig. 3) have all been very satisfactorily treated. Leriche and Froehlich (1936) and Fontaine (1936) have described their results using this method in elbow and shoulder fractures, and more recently Treves (1938) has also reported his successful use of the method in elbow fractures. To them must be ascribed the credit for discovering this useful method of treatment.

In general, one may say that any fracture of a non-weight-bearing part of a bone, where rotation cannot occur, is suitable for its use. Here, however, I wish to report the method and results in "minor" ankle fractures. The technique is as follows:—

1. *All ankle injuries are X rayed on admission.*—This is done *before* any clinical examination, for it tells us whether we are dealing with an abduction, torsion, or adduction fracture, and enables the clinical examination to be more usefully carried out.

2. *Clinical examination is then carried out.*—The radiogram having shown the type of fracture, and separated the grosser types of 2nd degree fractures, which are unsuitable for the method, it is necessary to detect those 2nd degree fractures which arise when a ligamentous injury on one side of the joint is accompanied by bone injury on the other (Fig. 1, 2nd degree, *b*), and which look in films like 1st degree fractures.

This is easily, accurately, and quickly carried out. The patient's foot is grasped and an attempt made to push the foot as a whole towards the fractured bone. No twisting must be done or the test is vitiated. Where the ligament is intact this can be done without causing any pain. If the ligament is injured, the patient immediately winces, and feels pain in the fracture (Roberts).

3. *Two per cent. procaine is injected into the hæmatoma*, 10–20 c.cm. being used as in Böhler's technique. Pain can be abolished by injections around the fracture, but the pain returns unless the hæmatoma itself has been injected. The pain must be completely abolished, and then the patient is allowed to walk home without any support.

4. The *patient reports* next day. The ankle is usually swollen, and he complains of tightness in that part, but commonly has very little pain. He is encouraged to walk on the foot. He again reports on the following day, and if pain is present another injection is made. In three instances this was necessary, but in all others one injection sufficed.

Check radiograms from time to time make sure that no displacement is taking place. The patient is encouraged to resume his normal activity, either at work or at play, but is asked to report each week until bony union has been shown in X ray films. This is the difficult part, for the patient, feeling perfectly fit, resents spending time in hospital, and several of my cases have not returned for supervision after the first few days.

FIG. 3.—Mr. N., on June 29th, 1938, sustained contusion fracture of the humeral head. Treated with procaine and mobilisation he had no pain, only slight tightness in shoulder. The photograph shows abduction five days after the injury. This man shaved himself all along, and on July 21st left to drive to the Lakes. Films now show calcification of callus and bones in perfect position.

CASE-HISTORIES

CASE 1.—A millworker of 34, on April 23rd, 1936, sustained a 1st degree adduction fracture of the ankle. It was injected with procaine, which completely relieved his pain, and he walked freely. He ceased attending on May 14th. Visited and radiographed on July 25th, 1938, he was completely fit. The fracture had united in perfect position.

CASE 2.—A brushworker aged 64 received on Oct. 19th, 1936, an adduction injury to the right ankle, resulting in typical 1st degree adduction fracture. It was injected with procaine. He had some pain two hours after the injection but it disappeared in an hour. Thereafter he felt that he "might not have had an accident." This early case was not encouraged to work, but after four weeks of walking about without pain he resumed work, and has had no trouble since. Radiograms now show bony union in perfect position.

CASE 3.—A braker of 65 was struck on medial side of the leg by a jute bale on Dec. 17th, 1936, sustaining a sprain of the medial structures of his knee and 1st degree abduction fracture of the ankle. The ankle fracture was injected. He was not allowed to walk without crutches, but was instructed to perform active movements of the foot hourly. He had no pain in the ankle after it was injected. On Feb. 11th, 1937, the fracture had united. The knee

was strapped at first, and afterwards he was given massage and diathermy, but was not cured until May 27th, when procaine injection cured a chronic knee sprain.

This case was too timidly treated. The patient should have been told to walk from the start, and the sprained knee should have been injected to begin with.

CASE 4.—A woman of 34, on Dec. 29th, 1936, fell through a trap-door in a shop sustaining a 1st degree abduction fracture of the ankle. On Dec. 30th the fracture was injected and the patient told to walk. There was still slight pain on Dec. 31st and a further injection was made. On Jan. 2nd, 1937, a final injection completely relieved all symptoms. She walked easily and well, attended parties, and carried out her household duties. By Feb. 20th the fracture had united in perfect position.

This lady sued the owner of the shop in which the accident happened. He would not believe her story that the ankle had been broken. Visited on July 27th, 1938, she had a perfect ankle. She says that before the fracture she had rheumatism in the foot. Now she never has any pain.

CASE 5.—A painter aged 41 had a typical 1st degree torsion fracture on March 11th, 1937. It was injected with procaine which completely relieved him. He reported on March 18th and was still free from pain. Radiography on April 15th showed bony union in perfect position. This man walked continuously free from pain following the injection. He was unemployed at the time but "felt that he could have worked," and on March 18th asked for his discharge. Visited on July 25th, 1938, he was perfectly fit and had no pain or disability.

CASE 6.—A woman of 54 received on March 15th, 1937, a typical 1st degree adduction fracture with slight displacement. Procaine was injected and the patient allowed to walk. Ten days later pain recurred, and another injection was made. She walked well and carried on her domestic duties during her treatment, and on April 15th, 1938, X rays showed bony union in perfect position. She was visited on July 22nd; the result was perfect and there was no disability.

CASE 7.—A seaman aged 49, on April 5th, 1937, received a 1st degree adduction fracture in his ankle which had an old ununited fracture of the medial malleolus. The fibular fracture was injected with procaine. This completely relieved him from pain, and he walked about normally. On April 22nd he resumed work. A control radiogram on Sept. 26th showed the fibular fracture united.

CASE 8.—A dock labourer aged 46 sustained on May 10th, 1937, a slight 1st degree adduction fracture. Only the tip of the fibula was avulsed. He was treated by an injection of saline, which relieved him for the time being. He was seen by a colleague when he reported, and told not to put any weight on his foot. When I saw him again on May 25th he still had pain which was permanently relieved by procaine. He did not report for a control radiography. Presumably he is fit and well.

This man was treated while we were trying various solutions which we have since given up using. He was out of my care for two weeks and was incapacitated for two weeks, so I class him as a failure; but it must be observed that a modified technique was adopted in his treatment.

CASE 9.—A housewife aged 73 received on Oct. 7th, 1937, a 1st degree adduction fracture, with slight medial displacement. Procaine was injected with complete relief of symptoms. She went home to the country, and called to see me from time to time when shopping in Dundee. She eventually objected to coming, and it transpired that she had no idea her ankle was fractured! A radiogram on Nov. 20th showed the fracture united in perfect position. This patient suffered no discomfort from the fracture, and the position was actually improved by the movements.

CASE 10.—On Oct. 18th, 1937, a housewife of 60 sustained a 1st degree torsion fracture. She was relieved and walked home after procaine injection. She did not report at all. I visited her on July 22nd, 1938, and found her perfectly well. The ankle was painless and moved freely. She said her ankle "was rare after I got yon jag, and never bothered me at all." She had been absolutely free from all pain and discomfort following the injection.

CASE 11.—A woman aged 74, on Nov. 5th, 1937, injured her right ankle, which was treated as a "sprain" for ten days. She had pain and was unable to walk. The ankle was then radiographed and a 1st degree torsion fracture was found. I saw the patient and injected procaine, and she was able to get about without any pain. I did not see her again until May, 1938, when I was consulted about another matter. She told me she had got about perfectly, but had slight pain in April, 1938, which a bonesetter had cured. Clinically the ankle was perfectly normal.

This lady was never told that she had a fracture. She evidently had a chronic sprain which developed in April, 1938, which was cured by manipulation. I find sprain of the anterior annular ligament almost constantly present in torsion fractures, and in these cases this ligament is injected as a routine.

CASE 12.—A factory inspector aged 50 sustained on Dec. 30th, 1937, a 1st degree adduction fracture. Procaine was injected and next day he resumed work, which consisted of walking round factories all day. He had no pain, and control radiography on Feb. 7th, 1938, showed the fracture united in perfect position.

CASE 13.—A message boy of 17 received on Jan. 17th, 1938, a high 1st degree torsion fracture of the fibula—really a spiral fracture of the shaft. On Jan. 17th and 24th procaine was injected, which completely relieved him, and he walked and cycled freely. He was extremely active, and on Jan. 31st I applied a walking cast as I feared such activity might prevent union. This was removed on Feb. 21st, and on Feb. 28th X rays showed bony union.

This boy used the fractured leg freely for two weeks without any pain or disability. It was then fixed for three weeks, and six weeks after the injury sound union was found. The movement had not delayed union.

CASE 14.—A packer aged 24 received on Feb. 17th, 1938, a 1st degree torsion fracture, with slight displacement. She was seen elsewhere, and a plaster cast applied. I saw her on Feb. 21st, removed the cast, and injected procaine. This completely relieved her, and except for slight ankle swelling she had no disability. I advised her to resume work on Feb. 28th, but she did not report after this. I visited her on Feb. 28th to find her away from home. Her mother said she was perfectly well and had suffered no trouble with the fracture.

CASE 15.—A spinner aged 59 sustained on Feb. 21st, 1938, a 1st degree torsion fracture. It was injected and relieved. She reported on Feb. 28th, but as she had been free of all symptoms she did not report after this. I visited her and found that she had resumed work and has now no trouble. She has not reported for radiography. Clinically no abnormality can be detected.

CASE 16.—A housewife of 62 received on April 16th, 1938, a very shallow oblique 1st degree torsion fracture. Procaine was injected on April 16th and 24th with incomplete relief. She walked throughout treatment but had some pain. X rays on July 25th showed bony union in perfect position, and she is now symptomless. I think this failure was due to the procaine not reaching the hæmatoma.

CASE 17.—A printer of 18, on June 27th, 1938, received a 1st degree adduction fracture. It was very

slight, only the tip of the fibula being avulsed. Procaine injection relieved her completely, and she walked perfectly, resuming work on July 11th. She is quite free from discomfort.

CASE 18.—A steel erector of 54 sustained on July 11th, 1938, a 1st degree adduction fracture which was injected with complete relief. The following day he reported and said he "felt like jigging" on his ankle, and proceeded to dance the highland fling. He resumed work the following day. He was visited on July 23rd and was absolutely free from pain.

RESULTS

Since April, 1936, 18 cases of 1st degree ankle fractures have been treated as described. All are now completely restored to their pre-accident condition. Where one aims at abolishing all discomfort and incapacity, results should be described as "successes" if the patient is rendered symptom-free, and gets about normally, without splints, during the process of union; or "failures," where for some reason pain is not completely abolished, or the patient is unable to make full use of his limb. In this series there were 14 successes and 4 failures.

The cause of the four failures varied:—

Case 6.—This patient had a recurrence of pain ten days after the injury. It was abolished permanently by a second injection, so the failure was only relative.

Case 8.—Here saline was used instead of procaine, and was found to be unsatisfactory. Also, full use of the foot was not encouraged.

Case 13.—This lad, because of the abnormal shape of the fracture, was plastered two weeks after the injury. The plaster was kept on three weeks, and a week later dense callus was shown by X rays. I feel sure our timidity was unwarranted, and had he been left alone would have been in full activity all along.

Case 16.—This lady had mild pain which persisted in spite of injection. She got about, and union was normal, but she was not symptom-free. The failure I think was caused by my inability to introduce the needle between the fractured bone ends as it was a shallow, oblique fracture.

Of the 18 cases, 16 have been treated long enough to show bony union radiograms. Of these 16 only 11 have reported for X ray examination and in them bony union in good position was found. The remainder have been visited, and all were found fit and well, with clinical evidence of union. It is not unreasonable to assume that bony union has taken place in these cases.

SUMMARY AND CONCLUSION

In this paper I have described in detail the various types of ankle fractures (so-called Pott's) and have divided them into two great classes: the "minor fractures"—a limited group which are essentially stable, and which require no support; and the "major fractures"—which are unstable and require most careful reduction and fixation.

Leriche's method of injecting local anæsthetic which I have adopted in these "minor fractures" has given me very satisfactory results.

I have reported my 18 cases in some detail, for only by doing so can an impression of the scope of the method be given. I have especially refrained from reporting the duration of treatment, because I whole-heartedly condemn the prevalent tendency to attempt to minimise the duration of treatment of fractures. In fracture work we aim at complete recovery, immediate and remote, and it matters not how long we take to attain our end. The object of the procaine injections is not to shorten the treatment or lessen the surgeon's work but to lessen the patients' suffering and incapacity during treatment. In practice the method calls for more care and attention on the part of the surgeon and assistants than the more orthodox methods of treatment, but the pleasure of seeing painless ankle fractures walking about a few hours or days after the injury more than repays one for the slight extra trouble.

Theoretically, two main arguments can be advanced against the method. First, that displacement may result. This has not happened in any of my cases. On the contrary, where slight displacement was present it has been found to disappear with active use of the foot. This is not really surprising when it is remembered that the ends of the long bones assume their definitive form under the moulding influence of muscular action. If normal muscular activity is restored to these fractures, they are actively moulded to their normal form.

Secondly, in theory, non-union might be expected. This has not been found in any of my cases. If anything, activity seems to encourage early calcification of the callus. In one instance (Case 7) an old ununited fracture of the medial malleolus was present. This had been treated in plaster. Yet a similar fracture at the tip of the fibula united normally. Again, rotation is nowadays considered to be the chief cause of non-union, and at the ankle rotation of the fragments does not occur.

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THE LANCET 100 YEARS AGO

October 13th, 1838, p. 123.

From an account of the opening of the new session at the Borough Schools.

No session ever commenced with less enthusiasm in the Borough, than the present. The gloss of "Guy's" and "St. Thomas's" has rubbed off since "Sir Astley" left, and the *prestige* of the remaining names has no charm for students. The fame of "the Borough" wants new painting. Its medical atmosphere is dull and gloomy; its glories have become flat, stale, and unprofitable. The yellow-red chariot of "Bransby" rolls languidly—though very punctually this week—and Mr. Key modestly walks. Mr. Travers is in yet more doleful eclipse than ever, and Dr. Williams' hands are now quite lost in his pockets. There is no bustle, no stir, nothing new. The old courses are to be re-delivered, and the students have found out the farce of "recognised" lectures. The routine of the schools is eternal, and no bright intellectual comet ever crosses their path to excite the eye and inform the mind. . . . In the lectures nothing new, in the style nothing original, in the manner of delivery nothing exciting. Ten years ago, Messrs. "Bransby," Key, Morgan, Bright, Addison, Travers, Tyrrell, Williams, and so on. Five years ago, "Bransby," Travers, and Co. Last year the old company still there. Next year, still the ancient firm,—re-reading, or re-gabbling, the same old, vapid, sleepy stuff, to the end of the reign of King Harrison. Alas! to draw checks, to direct painters, to order fresh brooms and new dusters, this is all that occupies the mind of that intelligent man. For any achievements beyond these, his Majesty has a capacity about equal, it may reasonably be supposed, to that of the pump which yields the water which keeps the courts and floors so sweet and clean.

OXYGEN THERAPY

WITH A NOTE ON A NEW NASAL MASK

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OXYGEN therapy is a time-honoured procedure and yet there is little unanimity of opinion with regard to the best method of its administration, and its scope and clinical value are in even greater dispute. The relief of anoxæmia by oxygen is, however, based on sound principles, which must be appreciated if oxygen is to be given efficiently. This applies to the methods of administration as well as to the successful selection of patients who will benefit from this form of therapy.

Indications

In general it is true that the onset of cyanosis is the indication for oxygen administration. It is equally true that the relief of cyanosis with oxygen may be spectacular in some cases and imperceptible in others. In describing the indications for oxygen therapy the real issues are confused if individual diseases are discussed. There are certain broad principles which must be appreciated if oxygen is to be used with understanding. The dangers of anoxæmia and its sequelæ must be considered and the clinician must be capable of differentiating cases that will not benefit from oxygen therapy from those that will. This is only possible if certain physiological facts are appreciated.

The first principle concerned is that blood flowing through a healthy lung is more or less completely saturated with oxygen. In other words, the administration of oxygen to a healthy individual will not significantly increase the amount of oxygen taken up by the blood. The practical bearing of this characteristic of hæmoglobin is well illustrated in the case of pneumonia. In the text-book case of lobar pneumonia where there is outspoken consolidation of one or more lobes, and where the rest of the lung remains unaffected, anoxæmia is due largely to the flow of blood through the consolidated and unaerated lobe or lobes. It is obvious that any oxygen that is given can penetrate the solid lobe only by the very slow process of diffusion. Furthermore, the blood passing through the healthy lobes is already fully aerated and no amount of oxygen will supersaturate it. Under these conditions the administration of oxygen will have but little effect on anoxæmia; the oxygen cannot reach the blood in the solid lobes and it cannot over-saturate the blood in the healthy lobes.

On theoretical grounds, therefore, little relief of anoxæmia is to be expected from oxygen therapy in outspoken lobar consolidation. There is good clinical evidence to support this generalisation. Observation of the patient seldom reveals a significant diminution in cyanosis. The published results of analyses of the arterial blood are difficult to interpret as details of the pulmonary lesion are seldom given. It has been established, however, that in about 40 per cent. of all patients with anoxæmia in pneumonia, the anoxæmia is not relieved by oxygen. Lundsgaard (1925) has pointed out that this is caused by the flow of blood through consolidated lung areas which are inaccessible to air (Binger 1928). Fortunately anoxæmia is seldom severe in these cases, as the pulmonary circulation through the consolidated areas is diminished.

In broncho-pneumonia the situation is entirely different. The lesion is scattered throughout the lung and there is no large single area of consolidation. Aeration of the blood is impaired not because aeration is absent in the inflamed patches but because ventilation is deficient in these areas. Any oxygen that is given has every chance of reaching the poorly aerated capillaries. In acute broncho-pneumonia cyanosis may be extreme and can usually be relieved if oxygen is given efficiently (Binger 1928).

The majority of cases of acute anoxæmia fall in or between these two groups. At the one extreme are cases of outspoken lobar consolidation, in which little relief of cyanosis is to be expected from oxygen therapy. At the other are the broncho-pneumonias, often with intense cyanosis, in which the benefit from oxygen may be spectacular. Most cases fall between these two extremes. The generalisation can be made that the more scattered the lesion throughout the lung, and the greater the number of added sounds heard in the chest, the more effective will be oxygen therapy.

The second principle is that cyanosis or lack of oxygen does not cause dyspnœa. This may sound a rather revolutionary statement, but there can be little doubt that it is correct. "The relatively slight increase in the amount of air breathed during very serious anoxæmia has frequently been lost sight of in the interpretation of clinical symptoms. . . . In the very dangerous pure anoxæmia of high altitudes or CO poisoning increase in the breathing is not a prominent symptom" (Haldane and Priestley 1935). This quotation represents well-informed opinion among physiologists. In disease it is true that cyanosis and dyspnœa often coexist, but this by no means proves that the one is the cause of the other. There is overwhelming evidence that the dyspnœa of heart failure, pneumonia, or pulmonary congestion due to any cause, is not the result of anoxæmia (Christie 1937 and 1938). This is of considerable practical importance. Too often oxygen therapy is discontinued because the patient does not admit to any relief or because the respiratory rate does not fall. The relief of dyspnœa is of no significance in determining the value of oxygen therapy.

The third principle is that if oxygen is given at all it should be given continuously. To give oxygen once every two hours to a patient with broncho-pneumonia may be equivalent to placing him on top of Mount Everest and bringing him back to sea level every two hours for a "breather." All this can do is to prevent any form of acclimatisation. Most authorities are agreed that the intermittent administration of oxygen is probably worse than useless.

The dangers of anoxæmia have been emphasised by numerous investigators and need not be discussed in detail. With acute and severe anoxæmia damage to almost every organ in the body has been described. Where it is less severe and more prolonged the cardio-vascular system is the first to suffer. The degree of anoxæmia sometimes seen in acute broncho-pneumonia is sufficient to embarrass even the healthy myocardium, and may produce all the symptoms and signs of heart failure. If anoxæmia can embarrass the heart of a healthy individual, it can be no exaggeration to say that the life of a patient with broncho-pneumonia or acute pulmonary œdema may depend on the efficient administration of oxygen.

Methods of Administration

With the increasing popularity of oxygen therapy there has been a corresponding increase in the number of methods recommended for its administration. Numerous tents, masks, and nasal tubes have been devised, and the inventor of each method gives what is claimed to be convincing evidence of its superiority over all others.

By measuring the percentage of oxygen in the alveolar air it is possible to estimate the efficiency of any method. Almost all the methods have been analysed in this way and it might well be thought that a survey of the literature would reveal which was the best. Unfortunately this is not so. Not only is there a considerable divergence in the results of different investigators, but the results themselves are difficult to compare as details of technique are often lacking. Furthermore, efficiency is not the only essential in the administration of oxygen. Efficiency has to be associated with comfort of the patient, ease of operation, economy, and, perhaps more important than any, some guarantee that it will be maintained in restless, uncoöperative patients. The object of this investigation is to compare the various methods from the points of view of (*a*) efficiency, (*b*) comfort, (*c*) ease of operation, (*d*) economy, and (*e*) necessity for coöperation on the part of the patient. The administration of oxygen intravenously, subcutaneously, or per rectum need not be considered, as there is no rational basis for such procedures (Campbell and Poulton 1934).

All observations on efficiency were made on one healthy adult male (height 5 ft. 6 in., weight 9 st. 2 lb., basal oxygen consumption 226 c.cm. per minute). The criticism might be made that what applies to one individual might not apply to another, but I can see no good reason why this should be so. By confining our observations to one individual under standard conditions, such variables as differences in oxygen consumption, minute volume respired, and coöperation are reduced to a minimum. Altogether 207 samples of alveolar air were analysed. The technique employed to obtain and analyse the samples was similar to that described later for the nasal mask method. Cost of operation refers to cost to the London Hospital. (Any large hospital can obtain supplies at special prices.) The evidence on comfort, ease of operation, and necessity for coöperation was obtained for the most part from observations in the wards.

THE OXYGEN TENT

We have had experience of several oxygen tents and have found the one described by Poulton (Campbell and Poulton 1934) as satisfactory as any, and it is this tent which forms the basis of these observations. *Efficiency.*—If properly supervised there can be no question that the tent provides a very efficient method of giving oxygen. With an oxygen supply of 4 litres per minute the atmosphere in the tent contains between 40 and 50 per cent. of oxygen and there is bound to be a corresponding increase in the percentage of oxygen in the alveolar air (Campbell and Poulton 1934). *Comfort.*—Many patients have no objection to residence in an oxygen tent but some are frightened and others object strenuously to the confinement. Patients with delirium are especially prone to be intolerant. If they do not actually tear the fabric, they may make it impossible to keep the tent air-tight. Three times during the past year our tent has been extensively torn and the fabric had to be replaced at a cost of £7. *Ease of operation.*—Proper supervision of the oxygen tent means expert supervision. Most authorities are agreed that the air inside the tent should be analysed at least three times a day. The analysis is fairly simple, but even those accustomed to laboratory procedures require practice before the technique can be mastered. For these reasons supervision of the tent must usually be in the hands of one trained individual. In most hospitals this means an unwelcome complication of routine. Nursing of the patient may be very difficult and sometimes must perforce be inadequate, and a restless patient has to be watched lest the tent ceases to be air-tight. There may also be difficulties of hospital administration. It is not always easy to ensure a supply of ¼ cwt. of ice at a moment's notice. What with assembling the tent and its oxygen tanks, the provision of ice and fresh soda lime, wet and dry bulb thermometers, and the summoning of the expert to start operations, it can readily be understood that this method of oxygen administration may amount to a major ward procedure. Unless someone is available who has made oxygen therapy his business or his own particular hobby, this may mean that oxygen is not always given when it should be. *Economy.*—The oxygen tent is far from economical. It is expensive to buy and expensive to run. The cost to the London Hospital is approximately a shilling an hour. This does not include wear and tear on the tent, which may be considerable. *Coöperation.*—An undoubted advantage of the tent is that a minimum of coöperation is demanded from the patient.

Summary.—The oxygen tent is expensive to buy and expensive to run and requires expert supervision. Apart from these obvious drawbacks it is probably the most efficient method of administering oxygen to those who do not object to confinement within the tent. Some patients object strenuously and for these some other method should be used.

THE OXYGEN CHAMBER

The expense of constructing and running an oxygen chamber is almost prohibitive. For this reason its advantages will not be discussed in detail. I was responsible for the supervision of a chamber over a period of two years, and there can be little doubt that, from the point of view of comfort and efficiency, it is the ideal medium for oxygen administration.

THE HALDANE MASK

Many types of face masks have been described (Dautrebande 1937, Davies and Gilchrist 1925a, Hilton 1928, &c.). There is no convincing evidence that any of these are superior to the one devised by Haldane (Haldane and Priestley 1935). It is the newer and more comfortable type of Haldane mask, with moulded soft rubber face-piece, that we have used in this investigation. *Efficiency.*—There appears to be universal agreement on the efficiency of the Haldane mask and in our experience there is no more effective method of giving oxygen. With a rate of flow of 3 litres a minute, the oxygen in the lungs rises to about 50 per cent. (Fig. 1). (These results are in accord with those obtained by Davies and Gilchrist 1925a and b, Hilton 1928, Campbell and Poulton 1934 and Dautrebande 1937.) *Comfort.*—It is the exceptional patient who will tolerate the Haldane mask for more than an hour or two. Discomfort is caused not only by the presence of a large foreign body on the face but by the heat and moisture which develop within the mask. The face gets hot and sticky and the rubber irritates the skin. *Ease of operation and economy.*—The mask is perfectly simple to operate and is very economical. Wear and tear is negligible, and at a rate of flow of 3 litres per minute, which maintains an alveolar oxygen of 40–50 per cent., the cost is about 3*d.* per hour. *Coöperation.*—Apart from tolerating the discomfort, no coöperation is required from the patient. If the bag attachment can be seen to rise and fall with respiration, it can be assumed that the mask is well adjusted, and that the patient is getting his quota of oxygen.

Summary.—The Haldane mask is very satisfactory in all respects but one. Few patients will tolerate

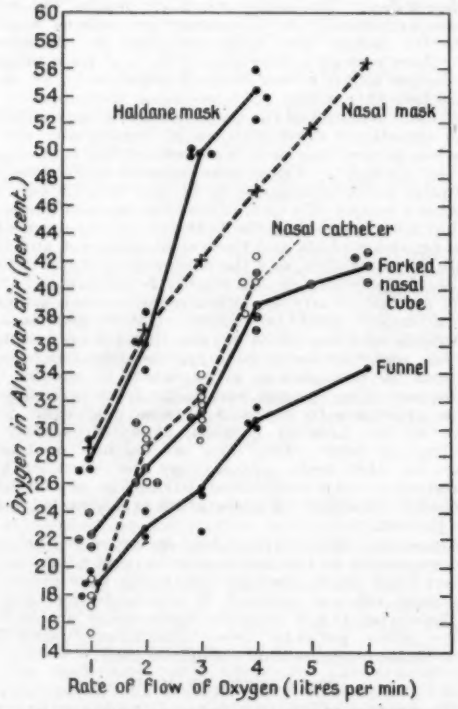

FIG. 1. *Efficiency of various methods for the administration of oxygen.*—The rate at which oxygen is delivered is plotted against the percentage of oxygen in the alveolar air. The points joined by lines represent averages and not observations. (In the case of the nasal mask averages only are given. For original observations see Fig. 3.)

its use for more than an hour or two. This drawback is sufficient to condemn the method for the routine administration of oxygen.

THE FACE TENT OR BOX MASK

This was originally described by Argyll Campbell in 1936, and many types have since been devised (Argyll Campbell 1936 and 1937a, b, and c, Barach 1937). As these have been widely recommended for use in the wards, as well as in aeroplanes, we have investigated them in some detail. We have used four types of face tent, all devised by Argyll Campbell (1936 and 1937a, b, and c): the wire frame face tent (with and without curtain), the cardboard face tent, and the celluloid face tent.

(1) *Celluloid face tent.*—As this is the most recent model of Argyll Campbell's face tent, we have investigated its efficiency in considerable detail. The length of the face tent used was 15·75 cm., and it was therefore large enough for subject C. E. G. on whom the tests were performed. *Efficiency.*—With the tent fitting snugly on the face it is obvious that any wastage that occurs will be through the lower end of the box. It might reasonably be suspected therefore that the face tent would be less efficient with the chin raised. Such a procedure would raise the open end of the box off the chest and so facilitate the entry of atmospheric air. To investigate the influence of position on the efficiency of the face tent three sets of experiments were performed. In the first the chin was held down so that the face tent became as much of a closed box as possible. In these circumstances the standard of efficiency was high, a flow of 6 litres a minute ensuring 58 per cent. of oxygen in the lungs (Fig. 2). With the chin raised so that the lower edge of the box lay 10 cm. in front of the chest wall, the efficiency was greatly impaired. With a flow of 6 litres a minute the percentage of oxygen in the lungs was only 28. A gentle draught flowing towards the patient (rate ½ metre per second) further reduced its efficiency (Fig 2). (In another subject the same decrease in the efficiency was observed on raising the head.) Only a small movement of the head is required to raise the lower end of the face tent 10 cm. off the chest. Such a movement may result in very inefficient oxygen administration, especially with draughts such as are liable to occur around the bed of a patient with pneumonia. It is true that the patient might be told to keep his chin down, or that sufficient pillows could be inserted under his head to ensure the correct position, but how many patients with pneumonia or acute heart failure will keep their heads in one prescribed position?* Furthermore, lateral movement of the head must also be limited to some extent. It might be thought that by lengthening the front of the face tent its efficiency would be increased. This may well be so, but it should be remembered that any such change will result in further limitation of movement. The only conclusion that can be drawn from these observations is that, with a restless patient, the efficiency of this method of giving oxygen will vary with the position of the patient's head. These remarks apply to the face tent in its present form. *Comfort.*—The face tent is light and fairly comfortable. If the chin is kept down a slight sensation of "stuffiness" may be experienced, but we have never found this to be really objectionable. *Ease of operation.*—If no effort is made to keep the patient's head in the correct position, the face tent requires little or no attention. *Economy.*—At the recommended rate of flow of 6 litres a minute the cost is approximately 6*d.* per hour. *Coöperation.*—The only coöperation from the patient that is required is that he should keep his head in the desired position. In our experience this is often too much to ask of a restless patient.

(2) *The wire frame face tent* (with walls of celluloid) (Argyll Campbell 1937a and b).—This presents no advantages over the celluloid face tent described above. It is not so comfortable and not quite so efficient (Fig. 2).

(3) *The cardboard face tent.*—This was made by ourselves according to the instructions given by Argyll Campbell (1936). Our workmanship must have been poor as it was found to be less comfortable and less efficient than the wire frame face tent (Fig. 2).

(4) *The face tent with curtain.*—We have used a 4½ in. curtain attached to the wire frame face tent (with celluloid walls) exactly as described by Argyll Campbell (1937a). This curtain certainly increases the efficiency of the face tent. Furthermore there is no serious wastage of oxygen when the patient raises his head. (At a rate of flow of 6 litres per minute the percentage of oxygen in the lungs of C. E. G. fell from 60 to 44 on tilting the head backwards.) The main drawback to the curtain is that even normal healthy individuals may find it very uncomfortable after an hour or two. With a rate of oxygen flow of 6 litres per minute we have found that after 5 minutes the air within the box contained 2·4 per cent. of CO_2 and that its temperature had risen from 21·5° C. to 27° C. After 15 minutes the temperature had risen to 28·5° C. and the subject was conscious of both the CO_2 stimulus to respiration and of stuffiness of the air breathed. To prevent over-heating Argyll Campbell has suggested that the frame be covered with linen and soaked with water. We have tried this, with discouraging results. Moistening the tent does delay over-heating but after it has been worn for 15 minutes there is little diminution in temperature. This procedure may also add to discomfort by wetting the face. With patients our experience has been the same. The face tent with a curtain will seldom be tolerated for any length of time.

* Since this paper was written, Argyll Campbell (*Brit. med. J.* 1938, 1, 1260) has suggested the use of a cardboard grid to close the lower end of the mask.

Summary.—The four types of face tent that have been investigated all present certain disadvantages. The efficiency of the celluloid face tent depends partly on the position of the head. A slight tilt of the head backwards may so reduce its efficiency that the patient receives a supply of oxygen which may be inadequate. This type of face tent is therefore only suitable for those patients who will coöperate sufficiently to keep their heads in one prescribed position. With a curtain properly attached to the face tent these drawbacks are prevented, but the complication of discomfort is added.

THE NASAL MASK

The nasal mask, with its bag attachment, is fully described later. It is as efficient as the face tent with a curtain, but not quite so efficient as the Haldane mask (Fig. 1). The alveolar oxygen can be maintained at 45 per cent. with a flow of 3–4 litres a minute. In our opinion it is the most comfortable of all efficient methods of giving oxygen with the possible exception of the oxygen tent. The mouth and eyes are not confined and the patient can attend to his nose by lifting the mask; expectoration is not interfered with. It is inexpensive to buy and inexpensive to run. With oxygen flowing at 4 litres a minute the cost is approximately 4*d.* per hour. The only coöperation required from the patient is that he should not displace the mask, and this seldom occurs except in delirious patients. Should this complication arise it at once becomes apparent as the bag attachment no longer rises and falls with respiration.

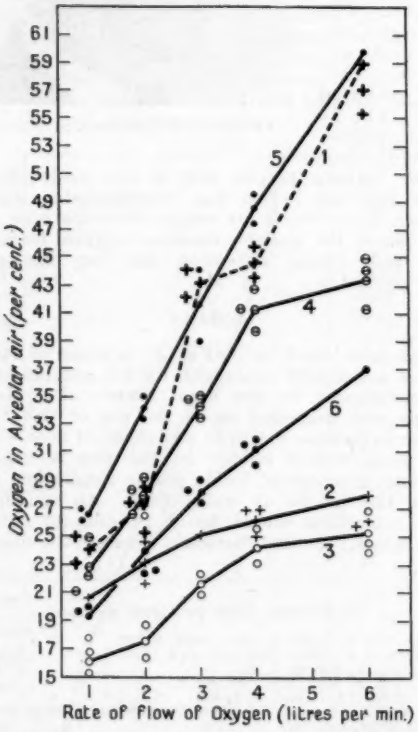

FIG. 2. *Efficiency of the face tent under various conditions.*—The rate at which oxygen is delivered is plotted against the percentage of oxygen in the alveolar air. (1) Celluloid face tent. The head is held so that the lower end of the box rests on the chest. (2) Celluloid face tent. The head is held so that the lower end of the box lies 10 cm. away from the chest. (3) Celluloid face tent. Position as in (2) but with draught of ½ metre per sec. (4) Wire frame face tent: worn with no effort to keep the head in any particular position. (5) Wire frame face tent: worn as in (4) but with 4½ in. curtain attached. (6) Cardboard face tent: worn as in (4). (The points joined by lines represent averages and not observations.)

Summary.—The nasal mask is an efficient, economical, and comfortable method for the administration of oxygen.

THE NASAL CATHETER

The nasal catheter has attained considerable popularity in oxygen administration. A No. 9 catheter is usually recommended and it should be inserted about 3 in. so that the tip lies in the nasopharynx. *Efficiency.*—The efficiency of the nasal catheter is shown in Fig. 1. These results are in approximate agreement with those published by Hilton (1928), Davies and Gilchrist (1925b), Ravenstene, Taylor, and Lemmer (1936), Poulton and Adams (1936), Marriott and Robson (1936), Barach (1926 and 1929), and Barker, Parker, and Wassel (1934). A flow of about 6 litres per minute is required to maintain 45 per cent. of oxygen in the lungs. *Comfort.*—There are patients with dyspnœa who do not object to a catheter in the nose but there are many who do. Much greater than the mechanical discomfort is the irritation of the mucous membrane where oxygen escapes from the catheter. Even if several holes are cut few patients fail to complain of discomfort if a flow of 6 litres a minute is maintained for more than an hour or two. With the flow distributed through two nasal catheters, sufficient oxygen to raise the percentage in the lung to 45 will seldom be tolerated. The generalisation can be made that the nasal catheter, whether single or double, is usually only comfortable when insufficient oxygen is being given. This may not hold in the case of children in whom a flow of ¼ litre per minute may be sufficient. At this rate of flow the catheter will probably be comfortable. *Ease of operation.*—Once inserted the nasal catheter gives no trouble unless the patient refuses to tolerate it. Insertion of the catheter may not be so simple. In sensitive patients cocaine may have to be used. Insufflation of the stomach with oxygen has been described (Ravenstene, Taylor, and Lemmer 1936, Marriott and Robson 1936). With the catheter inserted too far the patient may swallow oxygen with the saliva or food, and serious abdominal distension may result. *Economy.*—If the patient will tolerate a sufficient rate of flow it costs about 6*d.* per hour to maintain 45 per cent. of oxygen in the alveoli. *Coöperation.*—No coöperation is required from the patient except that he tolerate the method.

Summary.—The administration of oxygen by means of a nasal catheter seems a reasonable and simple procedure. Its simplicity is perhaps its main danger. If sufficient oxygen for an adult is given the catheter may not be tolerated, and it is so easy to reduce the rate of oxygen flow until the patient is comfortable. Under these circumstances the physician is merely deceiving himself if he believes that oxygen is being properly given.

THE NASAL TUBE

With a tube lying just inside the nostril oxygen can very easily be introduced into the respiratory tract. Numerous types have been devised, using either one or both nostrils; the only essential difference is the method by which the tubes are held in position. *Efficiency.*—The efficiency of the double or forked nasal tube is almost identical with that of the nasal catheter (Fig. 1). Davies and Gilchrist (1925b) and Poulton and Adams (1936) found the nasal tube to be somewhat better than the catheter, although it is difficult to understand how this can be so. *Comfort.*—We have made extensive use of nasal tubes on all types of patients and have found that few complain of discomfort. If the rate of flow is more than 4 litres a minute the patient may complain of irritation of the nose. *Ease of operation.*—If the tube remains in position no difficulty arises, but we have found it impossible to keep the tube in

position for any length of time, except with the most coöperative of patients. One would have thought that a small piece of tubing would be easily retained within the nostril, but the slight irritation due to its presence tempts the patient to rub his nose. No matter how the tube is secured most patients will displace it. After a prolonged trial with many different methods the routine use of the nasal tube was abandoned for this reason. *Economy.*—The nasal tube is quite economical and to raise the alveolar oxygen to 45 per cent. costs about 6*d.* per hour. *Coöperation.*—The only coöperation that is required is that the tube should be left alone. As has already been explained, this is too much to ask of most patients.

Summary.—The nasal tube is an ideal method of giving oxygen, except for the difficulty of keeping the tube in position. We know of no means whereby this technical difficulty can be overcome.

THE FUNNEL

The administration of oxygen by means of a glass filter funnel placed near the mouth is a time-honoured procedure, but it has been shown repeatedly that very little, if any, of the oxygen given ever reaches the lungs (Barach 1926, Hilton 1928, Davies and Gilchrist 1925b, Campbell and Poulton 1934). If pressed tightly against the face the funnel may be more effective (Fig. 1), but no patient will tolerate this procedure for as much as an hour.

Conclusions

(1) The indiscriminate administration of oxygen to any patient who is cyanosed and acutely ill is in part responsible for the conflicting evidence on the value of oxygen therapy. Oxygen should only be given when there is a reasonable expectation of relieving anoxæmia. Where cyanosis is due to localised consolidation or to localised collapse of the lung, it can seldom be relieved by oxygen. Where cyanosis is due to a generalised impairment of aeration or to an inflammatory process scattered throughout the lung, oxygen, if properly given, should relieve cyanosis.

(2) An adequate supply of oxygen is as important as the method used for its administration. This can be assured only by the use of a proper flowmeter. A pressure-reducing valve is also recommended.

(3) The most satisfactory methods for the administration of oxygen are the nasal catheter, the nasal mask, and the oxygen tent.

(*a*) The nasal catheter is often too uncomfortable for continuous use if oxygen is given in amounts adequate for an adult. In infants the catheter may be satisfactory.

(*b*) The nasal mask is efficient, comfortable, and inexpensive. It is usually easy to operate but occasionally difficulty is experienced in fitting the mask to the nose.

(*c*) The oxygen tent is comfortable and efficient. It is expensive to buy and to operate and requires more or less expert supervision.

(*d*) Only four types of face tent were given a trial, and recent modifications of this method may prove to be satisfactory.

I wish to express my thanks to Prof. Arthur Ellis and the staff of the medical unit in the London Hospital for their willing coöperation.

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A NASAL MASK FOR OXYGEN ADMINISTRATION

The ideal method for the administration of oxygen should combine efficiency with simplicity of operation and comfort of the patient. Few of the methods at present available satisfy these criteria. Many of those which are most efficient will not be tolerated for any length of time, and many which are comfortable are hopelessly inefficient. The nasal mask described here may not be ideal in these respects but at least it has certain advantages over other methods.

The nasopharynx is so constructed that a considerable proportion of the respired air is deflected through the nose, even when breathing with the mouth open. We have used this characteristic of human breathing to enhance the efficiency of administration of oxygen by the nasal route. The principles involved are simple. They are somewhat similar to those utilised in the Haldane mask. Oxygen is run into a bag made of very light material. This bag communicates with a rubber mask which fits snugly over the nose. On inspiration the patient breathes oxygen from the bag and during expiration the bag fills again with oxygen.

FIG. 3.—The nasal mask in position.

DETAILS

The mask itself (A in Fig. 3) is made of rubber and is a standard production for the administration of anæsthetics by the nasal route. (Dr. Horace Evans first suggested to us the use of this type.) In our experience it will fit any shape of nose. With the mask resting lightly on the face a negative pressure is generated inside during inspiration, even when the mouth is wide open. An aluminium tube (B), which should be of 1·0 cm. (or not less than 8 mm.) internal diameter, connects the mask to

(*Continued from previous column*)

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the bag. By means of an aluminium clamp (E) and a canvas strap around the forehead (D) the tube and rubber nose-piece are kept in position. This strap need not be fastened very tightly as gravity helps to hold the mask against the face, and a canvas strap over the vertex prevents the mask from slipping downwards. By loosening the clamp (E) and adjusting a wedge on the nose-piece, the position of the mask can be adjusted to suit any type of face. A pad (C) is placed under the clamp.

The construction and situation of the bag (F) is of considerable importance. To be at all efficient this bag must deflate on the slightest suction. Even the flimsiest of rubber balloons are useless as their walls are too rigid. By far the best type of bag for this purpose is one made of goldbeater's skin. Such a bag will not only inflate and deflate with the greatest of ease but is also tough and durable. Oxygen is introduced into the bag through the tube (G). The further the bag is from the mask the greater will be the resistance to the flow of oxygen from bag to nose. For this reason the bag is attached to the head-piece itself, with a large-bore tube connecting it to the mask.

Oxygen should be delivered to the mask at a rate of 3 to 4 litres a minute. Some form of flowmeter is therefore essential. We have tried many types and have found the bobbin flowmeter the most satisfactory. It is unnecessary to moisten or to warm the oxygen. Some form of pressure-reducing valve on the tank is also advisable. Without it frequent adjustments of the tank are necessary. With it the oxygen is turned on and the flow remains constant until the tank is almost empty.

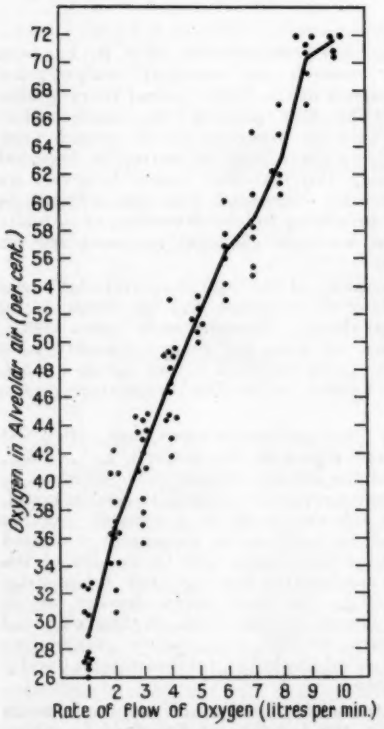

FIG. 4. *Efficiency of the nasal mask.*—The rate of flow of oxygen into the mask is plotted against the percentage of oxygen in the alveolar air (Case C. E. G.).

EFFICIENCY

The efficiency of any method of oxygen administration can only be discovered by measuring the percentage of oxygen in the lungs. This has been done with rates of flow of oxygen varying from 1 to 10 litres a minute.

All observations were made on two healthy adult males (C.E.G. and R. V. C.), whose basal oxygen consumption was 226 c.cm. and 265 c.cm. per min. Both had previously been trained in the delivery of alveolar air samples by the Haldane-Priestley method. The samples were taken at the end of expiration, and the oxygen mixture was inspired for at least five minutes before their delivery. While the sample was being delivered the flow of oxygen was interrupted. Any fallacy due to mixing of oxygen with alveolar air was thus prevented. Gas analyses were performed by the Henderson modification of the Haldane method (Peters and Van Slyke 1932). Where the sample contained a pressure of CO_2 which was less than 38 mm. of mercury, the experiment was discarded, as it had previously been ascertained that this was the lower limit of the alveolar pressure of CO_2 in these individuals.

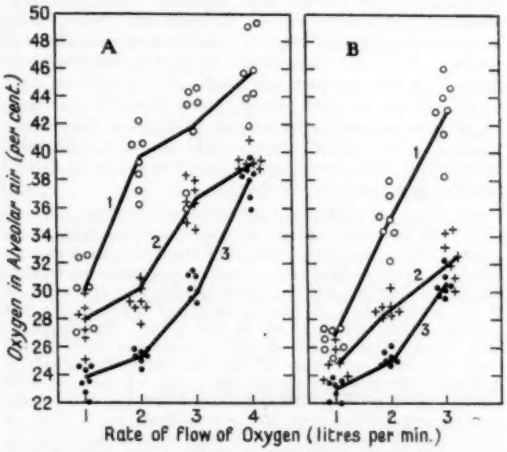

FIG. 5. *Importance of the bag attachment.*—The rate of flow of oxygen into the mask is plotted against the percentage of oxygen in the alveolar air. (1) (circles) The bag situated as shown in Fig. 3. (2) (crosses) The bag connected to the mask by 3 ft. of large-bore rubber tubing. (3) The mask used with no bag attached. (The curves on the left are from Case C. E. G. and those on the right from Case R. V. C.)

In Fig. 4 the percentage of oxygen in the lungs is plotted against the rate of flow of oxygen into the mask. It is apparent from these results that the nasal mask is an effective method of administering oxygen. The level of oxygen in the alveoli usually recommended as the ideal for therapeutic purposes is 40 per cent. A supply of 3 litres of oxygen a minute is all that is required to attain this level in healthy individuals.

The purpose of the bag is to avoid wastage of oxygen by delivering it to the lungs only during inspiration. It is obviously of practical as well as of theoretical interest to know how far this contributes to the efficiency of the method. Should it be of minor importance it might be preferable to discard the bag altogether and introduce the oxygen directly into the nasal mask. In Fig. 5 is shown the efficiency of the mask with and without the bag. There is a very real decrease in efficiency when the bag is discarded. There is also an increase in discomfort. The intermittent flow of oxygen through the nose, which occurs with the bag in use, is less irritating than when the flow is continuous, as is the case without the bag. Fig. 5 also demonstrates the importance of having the bag near the nose. With 3 feet of 7 mm. bore tubing inserted between bag and mask there is a considerable decrease in efficiency.

It might be thought that the amount of suction exerted on the bag would be negligible with the mouth held wide open. This is not so. It is not the

position of the mouth that regulates the amount of respired air which passes through the nose; it is the position of the back of the tongue and the soft palate. With the back of the tongue raised breathing may be entirely nasal although the mouth is wide open. With the soft palate raised, breathing is oral. In all the observations shown in Figs. 4 and 5 the pharynx and mouth were held in a comfortable relaxed position, and no attempt was made to deflect air through the nose or mouth.

The capacity of the bag is between 300 and 350 c.cm. If certain values for respiratory exchange are known, the change in volume of the bag which should occur on inspiration and expiration to ensure maximum efficiency can readily be calculated. For instance, if it be assumed that the respiratory rate is 20 per minute, that the tidal air is 400 c.cm., that inspiration occupies a third of the respiratory cycle, and that the rate of flow of oxygen into the mask is 3 litres per minute, then 150 c.cm. of oxygen will arrive in the bag during each breath—50 c.cm. during inspiration and 100 c.cm. during the rest of the respiratory cycle. In other words, all that is required of the bag is that it should deflate during inspiration to the extent of 100 c.cm., or a third of its volume. In these circumstances it can be calculated that the average inspired air will contain about 50 per cent. of oxygen, and the air in the lungs about 44 per cent. If it be assumed that the bag deflates at the beginning of inspiration (an assumption which is largely true), then, with a dead space of 120 c.cm., the air reaching the lungs will contain about 57 per cent. of oxygen and the air in the lungs about 51 per cent. The values for the tidal air and respiratory rate which have been assumed are applicable to the subject C. E. G. From theoretical principles therefore the oxygen in his lungs could be raised to 50 per cent. with a flow of 3 litres per minute into the mask. By actual measurement the percentage was found to vary from 35 to 45, with an average of 42 (Fig. 4). Due presumably to leakage around the nose and the inertia of the bag, the mask only operates at between 70 and 90 per cent. efficiency.

When breathing is rapid and shallow, the efficiency of the mask will be somewhat reduced. For instance, with a respiratory rate of 30 per minute and tidal air of 350 c.cm., the bag will only deflate by a fifth of its volume on each inspiration, and the oxygen in the lungs cannot rise to more than 44 per cent. It is for this reason that an oxygen flow of 4 litres a minute is advised in dyspnœic patients.

It must be emphasised that in testing the efficiency of this method fictitious results can be obtained if a voluntary effort is made to deflect air either through the nose or through the mouth. The mouth and nasopharynx must be held in a comfortable and relaxed position. Under these circumstances air can be felt to enter the nose on inspiration, even if no mask is used. With the mask in position we have yet to find the patient who does not contract the bag on inspiration.

COMFORT

The presence of any contraption on the face is associated with some discomfort and it is obvious that no patient really enjoys wearing the nasal mask. In our experience, however, no patient has refused to tolerate the mask or has complained of discomfort. One wore the mask continuously for over a week with no complaints, and many have worn it for from two to five days. Sometimes the patient complains of air blowing into his eyes. This means that the mask is too high on the nose and that it is leaking. It should be adjusted by means of the clamp provided for the purpose.

EASE OF OPERATION

Usually there is no difficulty in adjusting the mask to fit any type of face. Once adjusted the mask is simple to operate and no complicated instructions are necessary. If the bag can be seen to collapse by from a third to a fifth of its volume on inspiration it can be assumed that the patient is receiving his quota of oxygen and any apparent leakage around the nose-piece can be disregarded. The nurse should be instructed to inspect the mask occasionally. If the bag remains fully distended throughout the respiratory cycle the nose-piece has been displaced. When properly readjusted the bag will be seen to rise and fall with respiration.

The flow of oxygen should be maintained at about 4 litres per minute. With a proper flowmeter and reducing valve as described above, no adjustments are necessary to maintain a steady rate of flow.

The mask and all accessories can be obtained from Messrs. Siebe Gorman and Co., Ltd., 187, Westminster Bridge-road, S.E.1.

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A NEW CHEMICAL CONTRACEPTIVE

BY JOHN R. BAKER, D.Sc.,

R. M. RANSON, AND J. TYNEN

(*From the Sir William Dunn School of Pathology, Oxford*)

FOR the last ten years one of us (J. R. B.) has been engaged in research on chemical contraception under the auspices of the Birth Control Investigation Committee. The first part of the research was directed towards the discovery of the general principles underlying the killing of sperms by chemical agents. During the last four years, however, we have been mainly concerned with the attempt to apply these principles to the invention of a really powerful and harmless chemical contraceptive for practical use.

A full description of the tests of spermicidal power which we have standardised will be found in an earlier paper (Baker, Ranson, and Tynen 1937). In these tests we have for years invariably used human semen mostly provided by ten regular donors. All tests are carried out at the temperature of the body.

Pure—i.e., unmixed—substances are tried at various concentrations in the series 2, 1, ½, ¼, &c., per cent., and the lowest concentration necessary to kill all the sperms every time in half an hour is found. Observations are also made at 5 minutes. At the end of half an hour the sperm suspension is diluted with an alkaline fluid favourable to the life of the sperms, and any sperms that are only temporarily immobilised—e.g., by weak acids—become active again. The lowest concentration in the standard series necessary to kill (not merely immobilise) every time is called the killing concentration. Careful controls are kept.

Since the spermicidal powers of some substances are altered by the reaction of the fluid in which they are dissolved, and since the vagina may be acid enough to acidify the alkaline semen, a special

series of acid tests is performed with semen that has been slightly acidified with lactic acid.

TWO SPERMICIDAL SUBSTANCES

After introducing hexylresorcinol and other substances into practical use, we spent much time exploring the possibility of using other phenol derivatives, especially the parahydroxybenzenes. During the course of our work at this time we added a very small amount of a well-known organic mercury compound to one of our gelatin gels in order to inhibit bacterial growth and were surprised to find a marked increase in spermicidal power. This particular substance presents certain disadvantages, but as the result of investigating other organic mercury compounds we discovered phenyl mercuric acetate to be the most spermicidal substance in weakly acid solution of any that we have ever tested. Its killing concentration is 1/1024 per cent. in acid and 1/256 per cent. in alkaline media. Phenyl mercuric nitrate has a killing concentration of 1/1024 per cent. in both acid and alkaline media. It must be stressed that these are not simply the most spermicidal *harmless* substances, but *absolutely* the most spermicidal substances known, the acetate heading the list in acid and the nitrate in alkaline solution. A killing concentration of 1/1024 per cent. makes these substances no less than 512 times as spermicidal as quinine bisulphate and Chinosol, which have been used so much in chemical contraception.

The results of the tests of some extremely spermicidal substances and also of quinine bisulphate are shown in Table I. The substances are arranged in the order of their spermicidal powers, beginning with the most spermicidal.

TABLE I—RESULTS OF TESTS OF SPERMICIDAL SUBSTANCES AND QUININE BISULPHATE

Killing concentration (per cent.).	Acid test.	Alkaline test.
1/1024	Phenyl mercuric acetate. " " nitrate.	Phenyl mercuric nitrate.
1/512	Sodium ethyl mercuri-thiosalicylate.	—
1/256	Parabenzoquinone.	Toluquinone. Phenyl mercuric acetate. Sodium ethyl mercuri-thiosalicylate. Methylhydroquinone.
1/128	Toluquinone.	Parabenzoquinone.
1/32	Methylhydroquinone.	—
1/2	Quinine bisulphate.	Quinine bisulphate.

Our colleague, Dr. H. M. Carleton, has for long made a special study of the morbid histology of contraception (Carleton and Florey 1931, &c.), and throughout our work we have had the advantage of close collaboration with him. He has found the bitch a particularly convenient laboratory animal for the study of the pathological changes caused by harmful chemical contraceptives. Microscopical sections of the vagina of every bitch upon which we have tried our various preparations have been examined and reported upon by Dr. Carleton, who looks especially for sloughing and necrosis of the epithelium, infiltration with leucocytes, and vascular disturbances. By means of subcutaneous injections of œstrone we can bring the vaginal epithelium of the bitch into a condition in which it shows a remarkable resemblance to the human one (Baker 1938). Dr. Carleton has found phenyl mercuric acetate and nitrate to be harmless to the vagina of the bitch at concentrations sufficient to produce contraceptives of very high spermicidal power.

From the outset we had decided that our spermicide must be in actual solution in water in our final product, in order that no time should be wasted while it dissolved in the semen. There is no branch of pharmacology in which rapidity of action is more important than in chemical contraception, since on each occasion on which a contraceptive is used there is no intermediate condition between complete success and complete failure, and on the average of all our specimens there are 460,000,000 possible reasons for failure in a single ejaculate of semen. If a sperm has time to enter the uterine os, it is presumably out of reach of any spermicide which may be present in the vagina.

PREPARATION AND TESTS

Since a solid product was desirable, for convenience of handling, and since the spermicide must be in solution in water, we have worked with gelatin gels. For the spermicide we have preferred phenyl mercuric acetate to the nitrate. Although the latter is the more spermicidal in alkaline media, it possesses disadvantages which outweigh this advantage and would outweigh it even if the mixed semen and vaginal fluid were alkaline. Actually there are reasons for supposing that the semen may usually be changed somewhat to the acid side of neutrality by the lactic acid of the vaginal fluid. We have succeeded in making a permanently stable solution of the acetate in the water of our gels by buffering at about the *p*H of human semen. A powerful dispersive agent in emulsion is added to give rapid mixture with semen, and a little glycerol to make the whole product approximately isotonic with the body fluids. It has been a principle with us for some years that a chemical contraceptive should not be widely different in osmotic pressure from blood. Many commercial preparations are extremely hypertonic, and water drawn into the vagina may not only dilute the spermicide but also give undue lubrication. An account of the method of preparation of our product will be published elsewhere.

The final product is designated as P.383. The gels are cast as discs, each weighing 2·5 grammes. They are lightly dusted with starch grains to prevent their sticking to one another or to the glass tube in which they are packed. The gels are unsuitable, however, for use in hot climates without special cool storage, as they melt when warmed to near the temperature of the body. (The melting-point being close to that of dairy butter, the conditions under which that can be stored may be taken as a guide for the storage of gels, which however must not be frozen solid.)

The total spermicidal powers of these gels have been compared with those of the best-known contraceptive suppositories on the market. The tests of spermicidal power of suppositories are carried out in the same way as those of pure substances, except that the concentrations are differently expressed. Tests are made at the "standard" or S concentration of one suppository to 6 c.cm. of fluid (which is thought to be about the usual amount of fluid in the vagina after ejaculation), and at half, one-quarter, &c., of this concentration (S/2, S/4, &c.). It may be mentioned that every detail of these tests was settled before we had discovered the high spermicidal power of phenyl mercuric acetate.

The gels designated as P.383 have, according to these tests, a killing concentration of S/8. Of the ten well-known contraceptive suppositories which we have tested, three have a killing concentration of S/2 and three of S, while four fail to kill at S.

In acid media P.383 is even more spermicidal, with a killing concentration of S/16. If it were desired the spermicidal powers of these gels could be still further increased by adding more phenyl mercuric acetate, but it has been thought unnecessary to exceed S/8 and S/16 in alkaline and acid media respectively.

Since the rate of escape of the spermicide from the vehicle is as important as the total spermicidal power, a special diffusion test is carried out, in which mechanical mixing of the product with the semen is avoided. Observations are made at 2, 5, 15, 30 minutes, &c., up to 3 hours.

Four other makes of suppository on the market were compared with P.383 in the diffusion test. P.383 has the most rapid rate of diffusion: marked diminution of activity was observed in two minutes and all the sperms were generally dead (not merely immobilised) in five. Two of the marketed products which we tested diffused so slowly that scarcely any effect was observed on the movement of the sperms after an interval of half an hour and some activity was still evident after three hours. These were the two products which showed the best results in the test of total spermicidal power of all the ten which we compared with P.383. With the third proprietary product which kills at S/2, some sperms were still alive at 15 minutes in the diffusion test. It would be waste of time to apply the latter test to those suppositories which failed to kill even at S in the test of total spermicidal power, in which all the killing power extractable from the product is made use of for action on sperms, without any reliance on the diffusive power of the product.

Repeated trials showed P.383 to be harmless to the vagina and cervix of the bitch. As usual, in order to make the test stringent, we placed half the human dose in the vagina daily (except on Sundays) for a fortnight, and the bitch was then killed and the vagina and cervix sectioned and examined microscopically by Dr. Carleton. The gels were then distributed to clinical workers for practical test under medical supervision. Their reports on the æsthetic qualities of the gels are favourable.

CLINICAL TRIALS

One of us has pointed out (Baker 1935) the unreliability of reports on clinical tests of the effectiveness of contraceptives. One can never be certain that the product is used in the right way—e.g., before and not after coition—nor even that it is used at all on every occasion. It is not certain that any chemical contraceptive, however spermicidal, could ensure safety to a multiparous woman with a patulous or split cervix, in the absence of an occlusive pessary.

Table II shows the results of the clinical tests. It is important to stress the fact that the great majority of the women who tested the gels had already borne children, many of them being very fertile and having had repeated pregnancies (up to a maximum of 12) before starting to use P.383. The woman who became pregnant is multiparous and has a split cervix.

In addition to the women who appear in Table II, there are many who have used the gels alone or in various combinations, but about whom there are no exact data except that they have not reported themselves pregnant. One doctor alone has distributed over 2500 gels in this way, over a period of a year, without a pregnancy being reported to him. There are also 15 women whose husbands have used sheaths while they have used the gels. One woman in this category has become pregnant, but the clinical worker doubts whether in this particular case the gels were actually used.

TABLE II—RESULTS OF CLINICAL TESTS

Method used.	Months during which the method has been used.	Number of women.			Total number of woman-months* (approx.).	Pregnancies during use of P.383.
		Dr. M. Jackson's and Mrs. C. Harvey's data.	Dr. H. Wright's data.	Other data.		
P.383† alone.	1– 3	2	1	..	6	0
	4– 6	1	..	..	5	0
	7– 9	2	1	..	24	1
	10–12	4	..	..	44	0
P.383†, sometimes alone, sometimes with sheath.	7– 9	1	..	..	8	0
	10–12	1	..	..	11	0
	13–15	1	..	..	14	0
P.383† and rubber occlusive pessary.	1– 3	2	1	..	6	0
	4– 6	3	2	1	30	0
	7– 9	6	2	..	64	0
	10–12	5	4	..	99	0
	13–15	..	2	..	28	0
P.383†, sometimes with rubber occlusive pessary, sometimes with sheath.	1– 3	9	..	..	18	0
	4– 6	10	..	..	50	0
	7– 9	5	..	..	40	0
	10–12	5	..	..	55	0

* The number of woman-months is the number of women multiplied by the mean number of months during which they have used the preparation.
† In the early part of the test a slightly different formula, P.338, was used.

The standards which we have tried to realise in P.383 are the following (see Baker 1931 and 1935):—

1. It should be inexpensive.
2. It should be solid, and therefore require no special appliance for insertion into the vagina.
3. It should be small.
4. It should be unaffected by the ordinary range of climate.
5. It should neither leave any trace on the skin when handled, nor stain fabrics.
6. It should contain no volatile nor odorous substance.
7. It should be non-irritant to the vagina, cervix, and penis.
8. It should be without pharmacological effect if absorbed into the blood stream.
9. It should contain a substance reducing surface tension, to ensure the smallest crevices of the folds of the vagina being reached.
10. It should kill sperms at S/8 or lower concentration in the alkaline and acid tests for suppositories, and the spermicide should diffuse rapidly out of the vehicle into semen.

Dickinson and Bryant (1932) use a closely similar list, but require also that it must not be easily displaceable.

It may be claimed that P.383 satisfy all these requirements, provided that the words "ordinary range of climate" refer to Great Britain and other cool parts of the world. With regard to the requirement that the product should not be easily displaceable, it may be stated that P.383 are fluid when melted at body temperature, but we have found that

sticky vehicles prevent that rapid diffusion of the spermicide which is so essential for success.

A SPERMICIDAL PASTE

At present many clinical workers employ an occlusive pessary smeared with paste, with or without a spermicidal suppository as well. The same spermicide and dispersive agent that have been used in the gel have therefore been incorporated in a product which can be smeared smoothly on rubber, which it does not damage. It is not affected by ordinary changes of temperature and no special precautions are necessary when travelling in very hot weather.

Since extremely high spermicidal power is not so necessary with pastes as with gels, owing to the existence of a barrier of rubber, we have not thought it necessary to include more phenyl mercuric acetate than is sufficient to give a killing concentration of S/4 in the test of total spermicidal power, when the S dose is two grammes. With this as standard dose, the killing concentration of the smearable product already on the market which has the highest total spermicidal power of any which we have tested is S/2. Another has a killing concentration of S, yet another immobilises but does not kill at S, while two further ones have little effect on sperms at S.

It is not necessary for the spermicidal principle of a paste to diffuse out of the vehicle so quickly as out of a gel, since the latter may be used with no mechanical barrier, and we have therefore contented ourselves with ensuring that the paste acts much more quickly in the diffusion test than the product already on the market which has the highest total spermicidal power. It may be remarked that the paste is perfectly compatible with the gels.

When Dr. H. M. Carleton had shown the paste to be harmless to the vagina and cervix of the bitch, it was subjected to a small clinical trial. Twenty women, nearly all of whom have previously had children, have been using the paste for periods up to six months. No pregnancy has ensued and the æsthetic reports are favourable.

A more detailed report of the research described in this paper is in course of preparation and will be published elsewhere. We shall then make full acknowledgments of the help that many people have given us. Meanwhile we wish to thank Dr. Margaret Hadley Jackson, Mrs. C. Harvey, Dr. E. F. Griffith, Dr. Helena Wright, and Dr. Isobel U. Sloan for their help in clinical trials of the gels and paste, and Dr. C. P. Blacker, the hon. secretary of the Birth Control Investigation Committee, for his advice and encouragement. We are also indebted to the Committee on Maternal Health (New York), which, through the Birth Control Investigation Committee, has given financial assistance to our work in the last year.

The gels designated as P.383 and the paste above described are being manufactured and marketed by the British Drug Houses Ltd. under the name of Volpar Gels and Volpar Paste, the word being a contraction of "voluntary parenthood." We are indebted to the scientific staff of the British Drug Houses Ltd. for many useful suggestions and much valuable assistance which have contributed in no small measure to the success of the investigation.

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CARDIAZOL CONVULSION THERAPY IN NON-SCHIZOPHRENIC REACTION STATES

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SINCE Meduna introduced convulsion therapy in 1934 its usefulness has been increasingly appreciated and its value in the treatment of schizophrenia is no longer in doubt. Meduna based his treatment upon observations that epilepsy and schizophrenia are seldom concomitant and that schizophrenic symptoms sometimes clear up after the occurrence of one or more spontaneous fits. The rationale of the treatment is quite unknown, but its success is by no means confined to schizophrenic subjects. It appears to influence abnormal affective reaction states rather than particular mental disorders and its effects vary with the duration of the illness and the amount of dissociation of personality rather than the type of mental disorder, provided there are no structural brain lesions. In the course of treating schizophrenic patients we were so impressed by the frequency and rapidity with which abnormal affective reactions were influenced that we were led to experiment with non-schizophrenic reaction states.

We have so far treated 4 patients suffering from acute mania, 5 cases of psychotic depression, and 3 patients showing hysterical emotional disorder.

MANIA

CASE 1.—A talented art student aged 18¼, who had won several scholarships. There were no previous breakdowns. Admitted in a state of typical acute mania, she was euphoric and elated, talked excitedly, sang and laughed immoderately, believed (which was quite untrue) that she had a marvellous voice and was already a great actress, and was obsessed with the idea, the absurdity of which she could not see, of immediately marrying a well-known violinist, whom she had never met.

A 14 days' course of somnifaine narcosis had no appreciable effect on her psychosis. She was given her first Cardiazol convulsion just over two months after the onset of her attack. After 2 fits she talked and behaved quite normally and proved to be a very intelligent and understanding girl. Only 3 fits in all were given. She has now remained perfectly well for seven months and is back at work.

CASE 2.—A shorthand-typist, single, aged 31, who was well educated and intelligent, but described as having always been "temperamental" and difficult to get on with. There was a history of three previous breakdowns: 1923, a phase of depression following an attack of jaundice; 1932, an attack of acute mania lasting eight months; 1933, a suicidal attempt, followed by a mixed phase of rapidly alternating depression and elation.

On admission she was in a state of acute mania with much psychomotor over-activity. She was very noisy, emotionally uncontrolled, and subject to rapid changes from flippant friendliness to hostility. Two courses of somnifaine narcosis were given with a short abatement of her acute symptoms. She then relapsed into a wildly excited state, refused food, and was destructive and degraded in habits. Cardiazol therapy was started, and after the third convulsion she became quiet and amenable and began to converse rationally. Uninterrupted improvement continued and treatment

ceased after 13 convulsions. She was discharged recovered on May 12th, 1938, but has since relapsed.

CASE 3.—A single woman aged 38, who had had no previous breakdowns but had always been obstinately self-willed and dictatorial, touchy and difficult. She had had phases of over-activity and was obviously a person of chronic hypomanic disposition. On admission she showed a press of ideation and motor excitement, talked incessantly and without any judgment, and was noisy, interfering, morbidly self-satisfied, and rather erotic. As she showed no signs of improving, cardiazol was started, four to five months after the onset of her illness. She improved slowly but steadily throughout her course of 20 convulsions. At the end she was still rather irresponsible and interfering, but was reasonable and had good insight. Improvement continued and she was discharged on June 9th, 1938, "more easy to get on with and manage than ever she used to be" according to her friends. She is back at work and is doing well.

CASE 4.—A single woman of 26, whose past temperament was similar to that of Case 3. She was admitted in a state of motor and psychic over-activity and was elated, interfering, aggressive, and erotic. A fortnight's course of somnifaine narcosis left her unimproved. Convulsion treatment was postponed owing to attacks of intermittent pyrexia, until her acute symptoms had remained unabated for about five months. After 5 cardiazol fits she was in a state of fair remission and only 8 convulsions in all were necessary. At the end of her treatment she showed no affective abnormality, had good insight and conversed normally. She is now at home, having kept well for over five months.

DEPRESSION

CASE 5.—A married woman, aged 29, suffering from a recent attack of agitation and depression. She had had milder anxiety attacks in 1931, 1933, and 1935. When treatment was started she had been in a state of severe agitation for three months. She was completely obsessed with her troubles and could take no interest in her person or environment. She described incessantly how incompetent and unworthy she was, how she had ruined her family and how hopeless was her case. Her recovery was dramatic; after 4 fits she was smiling, cheerful, and busy, making herself a dress. Her course was stopped after 8 fits, when she exhibited a pleasant, happy, energetic personality, with full insight. She has now been perfectly well for eight months.

CASE 6.—A woman of 26, who became deeply depressed and suicidal shortly after childbirth. She was dull, anergic and retarded and felt weighed down with misery. Treatment was started three months after she became ill. After 2 fits she had thrown off her depression was was active and smiling. Her course was stopped after 7 fits. She has now remained perfectly normal for over three months.

CASE 7.—A young married woman, whose "nerves had been bad" for nearly two years and who became acutely depressed while in hospital for curettage. She was tearful and miserable, and was afraid of losing her reason and of harming herself. Cardiazol treatment was started four and a half months after the onset of acute symptoms. After 2 fits she was greatly improved—"all my fears and awful feelings seemed to drop away from me"; after 5 fits her affective state was quite normal and her course was stopped after 8 fits. She has been well for over three months.

CASE 8.—A woman aged 32, whose breakdown came on a few days after childbirth. Some transient improvement followed a fortnight's course of somnifaine narcosis, but she was again severely depressed, anergic, and retarded, when convulsion treatment was started, six months after her illness began. After 2 fits she was quite bright and cheerful and began to eat ravenously. She soon became unduly self-satisfied, over-confident, irritable, and quarrelsome; in fact a state of hypomania set in. After 10 fits she took advantage of her voluntary status and departed. Her manic phase soon cleared up at home and she is now reported to be quite well.

CASE 9.—A single woman, aged 33, whose personality was always extremely quiet. Her interests were limited and she was inclined to "brood" and worry over trifles. She was previously in hospital in 1935 in a phase of depression, but discharged herself in a state of partial remission. She was readmitted after making a suicidal attempt. She was depressed, with marked psychomotor retardation, quite unable to concentrate and felt that "everything was too much for me." She expressed no delusional ideas and gave no evidence of hallucinations. Her condition became progressively worse. A course of somnifaine narcosis produced a temporary alleviation of the symptoms. She then became more deeply self-absorbed, wrapped up in her misery, and difficult with food; she developed a rosacea with secondary infection and this adding to her misery, she again exhibited suicidal tendencies. A course of 20 cardiazol convulsions was given, during which she showed no substantial change. The course completed, she showed signs of remission, began to converse more freely and to discuss her symptoms rationally and with insight. She took her food well and showed an active interest in her surroundings. She suffered a partial relapse in July, but is once again convalescent. The illness in this case had extended over three years.

HYSTERIA

CASE 10.—A woman of 30, who had an illness thought to be "sleepy sickness" at the age of 13. A slightly parkinsonian facies and accommodation-convergence defect supported the view that her hysterical condition was a residuum of epidemic encephalitis. Her first acute breakdown was in 1926 and was followed by others in 1929 and 1931 without satisfactory remission. From 1932 to 1936 she was free from serious symptoms and in that period married and had two children. The birth of her second child in October, 1936, was followed by a severe breakdown, the symptoms of which waxed and waned but did not clear up until cardiazol was tried. Her main symptoms remained exactly the same throughout her illness. She was miserable and dissolved into tears at any excuse. She had an obsessional fear and conviction that she was going mad, and complained incessantly of her "terrible headaches" and hopeless state. She craved attention of any kind and welcomed every sort of special treatment. Various forms of suggestion, injections of distilled water, and a course of prolonged narcosis all proved useless. After 5 cardiazol fits she could not understand "how I ever got the idea that I was going mad." She needed only 7 fits to transform her into a cheerful, smiling woman, who had even lost her perpetual headache. Now nearly eleven months after treatment she is perfectly well and never has a trace of headache or depression.

CASES 11 and 12.—Two subjects of hysterical, emotional disorder, characterised in Case 11 by choreiform movements, precipitation on to the floor, sobbing, and refusal of food, and in Case 12 by sulking, amounting to mutism and semi-stupor, and outbursts of loud sobbing. Both patients were of poor intelligence and showed typical hysterical reactions. Both remitted under cardiazol treatment. Case 11 still has occasional mild tantrums, but her sister describes her improvement as a "miracle," and says she has never been better than she is now. Case 12 has departed and is now doing well in a domestic situation.

ANALYSIS OF RESULTS

Our material is far too slight to tabulate or to compare with that of schizophrenia. Results of

treatment in schizophrenia have been given by Meduna (1935, 1936, 1937), Angyal and Gyarfas (1936), Briner (1937), Küppers (1937), Cook (1938), Stähli and Briner (1938), and others. Results vary to some extent with the type of illness and the mode of onset, but depend mainly on its duration. It is reasonable to expect 60–70 per cent. of recoveries or social remissions if the illness has lasted less than a year, 40–50 per cent. if between one and two years, and 5–10 per cent. if over two years.

In the affective psychoses better results may be expected than in schizophrenia just as spontaneous remissions are more likely to occur.

Mania.—As regards mania all 4 of our cases recovered, although 1 has since relapsed. In none had the attack lasted more than six months, but Low and others (1938) report 5 recoveries out of 6 cases of more than two years' duration. Verstraeten (1937) and Goldstein and others (1938) have reported recoveries in recent cases. Doubtless many such cases would recover spontaneously in course of time. Convulsion therapy, however, cuts short the acute symptoms and with them the dangers of exhaustion, the nursing difficulties, and the period of hospitalisation and convalescence. All who have had experience of nursing turbulent manic patients will realise how important this is. In our experience convulsion treatment is able to modify acute exacerbations of excitement more efficiently than either continuous baths or prolonged narcosis, both of which are so often of merely transient benefit.

Psychotic depression.—Of our 5 depressed cases, 1 of severe agitation recovered dramatically, 2 of acute simple depression made rapid remissions which have been maintained for over three months, 1 of manic-depressive type swung over to a hypomanic phase which soon cleared up, and 1 of longer duration improved temporarily but has relapsed to some extent. We have treated no cases of involutional depression, but Low et al. claim two successes and others have been described (Verstraeten 1937). At present we have confined treatment to patients under 45 years of age, because the risk of producing vascular brain lesions must increase as middle-age creeps on. Experience of spontaneous epilepsy, however, shows that elderly arterio-sclerotic patients are often able to tolerate frequent convulsions without disaster.

The effect of cardiazol convulsions on depressive states is particularly encouraging, when we realise how vast an amount of disability is due to depression. The simple so-called constitutional depression in which the patient, destitute of energy and hope, is enveloped by a dull feeling of unaccountable misery is all too common both in general and psychiatric practice.

Hysterical states.—Three hysterical subjects have been successfully treated. Rapid and complete remission took place in a case of eleven years' duration, after psychotherapy and other therapeutic efforts had failed. Low et al. have reported a similar result in two psychoneurotic cases of five years' duration.

CRITERIA OF TREATMENT

It cannot be too strongly emphasised that convulsion treatment is a drastic method, which should not be given where prospects of spontaneous recovery are good, except in special circumstances. Treatment should only be carried out in a hospital adequately equipped for dealing with acute mental disorder, for convulsions occasionally may be followed by severe excitement, noisiness, and even suicidal attempts. The technique, complications, and dangers have been described elsewhere (Cook 1938), but the danger of lighting up old, quiescent tuberculosis should be mentioned. Although danger to life is insignificant as long as the patient's bodily health is unimpaired, particularly as regards cardiovascular and pulmonary systems, the ultimate effect of a number of major fits cannot be forecast. It is known that ischæmic glial changes may follow spontaneous epilepsy, and memory defect, which in our experience has been purely temporary, is occasionally seen after cardiazol treatment.

The main indications for treatment in non-schizophrenic states are: (1) when there is danger of exhaustion from excitement or agitation; (2) when a desperately pitiable state of misery or apprehension is present; and (3) in certain cases where the disorder shows no signs of improvement after some months. In the present state of our knowledge indiscriminate treatment of depressed, neurotic or excited patients must be firmly deprecated, but cardiazol convulsions may be a veritable boon in certain carefully selected cases.

SUMMARY

Cardiazol convulsion treatment has been applied to 4 subjects of acute mania, 5 of psychotic depression, and 3 of hysterical emotional disorder.

Recovery took place in all 4 manic cases, but 1 has since relapsed. Of the depressed cases 4 recovered, and 1, of over three years' duration, has greatly improved. All 3 hysterical cases have remitted, 1 of eleven years' duration having made a dramatic and apparently complete recovery which has now lasted eleven months.

A warning is given against the indiscriminate use of cardiazol convulsions, which should be confined to severe or intractable cases and given only in special hospitals.

We are indebted to Dr. G. Clarke, medical superintendent of Bexley hospital, for permission to publish the cases and to the nursing staff of the hospital, whose skill and enthusiasm have contributed largely to the successful results.

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Messrs. DOWN BROS. (21 and 23, St. Thomas's-street, London, S.E.1) have issued as an appendix to their 1935–36 catalogue a list of surgical instruments and appliances which have been invented since its publication. The list ranges from artery forceps to ward and sick-room sundries, and readers of our New Inventions columns will find here a number of devices with which they are already acquainted. The prices in the original catalogue are now out of date and the current price-list (which is however subject to market fluctuations) is included at the end of the appendix. Aseptic furniture and sterilisers are described in a separate book which was issued in 1935.

CLINICAL AND LABORATORY NOTES

TRAUMATIC MYOSITIS OSSIFICANS

BY W. B. R. MONTEITH, M.A. Camb., F.R.C.S.E.

JUDGING by published records myositis ossificans causes serious disability. Minor degrees, however, are possibly more common than is realised, and in the following case the disease was of secondary importance to the patient. It was nevertheless of clinical interest because its development was watched from the onset, and because it supports the accepted theory of development.

An agricultural labourer, aged 36, was brought to the Bourne Butterfield Hospital having been struck from behind by a motor-car when cycling from work. There was great swelling of the right shoulder, obscuring all bony landmarks, and shortening of the arm; also a large open wound in the right forearm, with a compound fracture of the ulna. The arm was immobilised in full abduction in bed with pillows and sandbags. Two days later X ray examination revealed a comminuted fracture of the surgical neck of the humerus, with very bad alignment (Fig. 1); the proximal fragment being abducted and the lower fragment drawn up internal to it, so that there was no contact between the fractured surfaces. One jagged spicule of bone remained attached to the head of the humerus, and one or two others had been completely separated. The fragments of the ulna were in good position.

Abduction with traction, the treatment of choice for the humerus, was impossible because of the forearm injury. A frame of sectional soft iron was made, on the lines of a Thomas's splint, but with bent elbow, and instead of a ring at the shoulder the bars turned downwards, and were fixed with bandages to the chest wall, thus keeping the splint in position. (Later, when the man was allowed out of bed, it was found necessary to surround the chest wall with plaster-of-Paris bandages in order to hold the bars steady.) It was hoped to obtain gradual extension of the humerus by its own weight while treating the forearm in the trough of the splint.

After three weeks, alignment was still poor with a sharp projecting spur and shortening as before, but in six weeks the position had improved, and the shortening was less. There was no callus formation; but faint cobwebby shadows were now evident for the first time, uniting the comminuted spicules of the original fracture. After nine weeks, the splint having been discarded and the only retentive apparatus being a sling and axillary pad, passive movements were begun. There was no bony union or true callus, but bone was unmistakable in the radiogram uniting the spicules. Massage and movement continued at weekly intervals, and six months after the injury there was slight functional improvement; but no bony union.

In April, 1936, ten months after the injury, the man said he had obtained light work and wished to discontinue treatment. The shortening of the arm was found to be less than half an inch and there was firm bony union, but a sharp spur could be felt at the site of the lower end of the original upper fragment. There was limitation of all shoulder movements, particularly those carried out by the deltoid. X ray films confirmed the presence of bony union, and also showed a long narrow piece of bone, in the position the separate spicules had formerly occupied. The man was recommended to continue at work and to use the arm as much as he could. He followed this advice and was not seen again until February, 1937, when he attended with a septic hand. He had worked regularly since last seen. Mobility had improved and the spur was disappearing but the bony deposit could be felt as before in the anterior axillary fold, apparently free in the substance of pectoralis major.

In October, two years and four months after the accident, he reported again. He was well satisfied with his arm, and admitted no disability in his work. For the last eight weeks he had been doing full work as an agricultural labourer. The arm now showed no measurable shortening but there was wasting of the deltoid muscle, and deltoid movements were weak, though the other functions of the shoulder were good. The pencil-like structure in the anterior axillary fold was unchanged. It was painless and did not interfere with joint movements. No further treatment was advised (Fig. 2).

DISCUSSION

It is now generally agreed that myositis ossificans is almost always preceded by severe tissue injury with much muscle bruising and extravasation of blood—often without a fracture. It is supposed that the new bone originates in minute fragments of periosteum torn off at the time of injury. Calcification can also occur in a hæmatoma far removed from bone and proceed to actual ossification. Part of the interest of the case here reported is that the actual points of origin of the new bone were clearly visible. Comminuted spicules, presumably carrying periosteum with them, are apparent in the first X ray pictures; and the first evidence of new bone is a very faint shadow joining the spicules and eventually incorporating them in the new formation. It is interesting that new bone was laid down here while there was no sign of regeneration at the main fractured surfaces; possibly this was due to interruption of the blood-

FIG. 1.—Early stage of fracture (July, 1935).

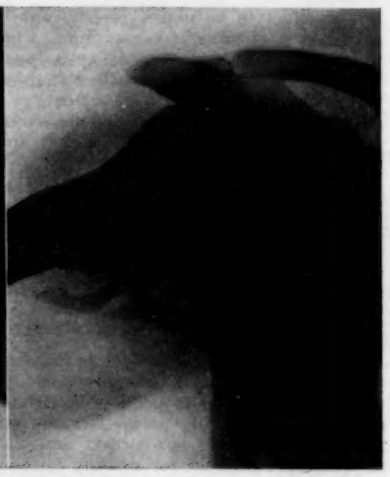


FIG. 2.—Final state of shoulder, showing bony deposit in anterior axillary fold (October, 1937).

supply to the humerus. The fractured ulna was at the same time regenerating normally. Since the new bone was well away from the joint the myositis ossificans caused no disability, and is purely of academic interest. It appears stationary in size and constant in density, and no advantage would be gained by surgical interference.

One other point of interest emerges from this history. Five to six months after the injury the insurance company, impatient of slow progress, wished to settle the case. As it was impossible at this stage to promise further improvement, reports of his condition were naturally unfavourable. The company obtained further medical opinion which was equally unfavourable. They decided to settle: and, on the basis of reports obtained less than six months after the injury, gave the man £800. I think he considers himself very fortunate.

Apart from the myositis ossificans I report this man's progress as an example of late satisfactory structural and functional recovery following a very severe and unpromising injury. Treatment had in the early weeks to be constantly watched and modified in an attempt to suit the conditions present. Later every opportunity was given to the natural functions of repair.

SUMMARY

A labourer sustained a comminuted fracture of the surgical neck of the humerus with poor alignment which could not be corrected in the ordinary way because of a compound fracture of the ulna of the same arm. Ten months later he returned to light work, with myositis ossificans in his anterior axillary fold, and two years after his accident he started full work without disability but still with definite new bone formation in his pectoralis major.

Bourne, Lincs.

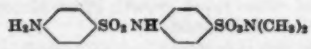
POLYNEURITIS AFTER ULIRON TREATMENT

BY C. T. VAN VALKENBURG, M.D.

AND

G. A. KREUZWENDEDICH VON DEM BORNE, M.D.

SINCE its discovery by Domagk (1937), Uliron, a sulphanilamide compound



has been successfully used in the treatment of gonorrhœa. The remedy has certain disadvantages. Löhe, Schölzke, and Zürn (1938) observed nervous disturbances in 4 patients after taking 60 g. and 30 g. The disturbances consisted of paresis of the muscles of the lower leg, and in one patient also in the region of the radial nerve. Freusberg (1938) observed polyneuritis after 32 g. and 18 g. of uliron, mainly of the lower legs. Hüllstrung and Krause (1938) mention a similar case. They injected uliron into pigeons without result, but after injections of D B 87 (an allied preparation) the birds had difficulty in walking and flying. Bürger (1938) reported a patient treated with 30 g. of uliron who was considered to have developed polyneuromyositis.

A man of 63, who had pyuria from a *Bacillus coli* infection, had taken in October, 1937, two tubes of Prontosil, without effect. From April 4th–8th, 1938, he took, daily, 4 uliron tablets of 0·5 g. each, and after a week's interval again 4 tablets daily for 3 days. He discontinued the treatment as he felt feverish, his temperature being 103° F. He also felt exhausted and had pain in the right lumbar region. On account of severe constipation the family doctor gave him an injection of 0·5 mg. of atropine sulphate and morphia. An examination of the alimentary system in hospital showed no obvious abnormality; his tongue was dry (possibly the result of the atropine injection). He said that an area of his upper jaw (mucous membrane and skin) and the skin round the navel felt numb. A few days later the sensations spread as "pins and needles" over his chest, arms, legs, hands, feet, and face. The sense of taste was also lost. Walking was difficult as his legs and arms became weak and the calves thin. On June 18th he came into hospital.

Apart from cystitis no abnormality was found except in the nervous system. The second, third, and sixth pairs of cranial nerves were normal. The sense of smell was weak. The whole of the sensory area of the 5th nerve was dysæsthetic and paræsthetic. The upper lip was swollen, later also the face round the eyes. The mucous membrane of the mouth was dry and the sensation of taste was changed, the patient saying that food tasted like "sand and cotton wool." The pharyngeal muscles were weak and swallowing was difficult. Breathing was shallow, the diaphragm moving poorly. There was dysæsthesia of the chest and abdomen which was much greater than on the back. The abdominal reflexes on both sides were sluggish. There was also dysæsthesia of the fingers, and paræsthesia (pins and needles), but movements were full though weak. The small muscles of the hand, especially the adductores pollicis and the interossei, were slightly atrophic, though the reflexes were normal. The muscles of the legs were all weaker than normal; they felt slack and were thin. The toes moved normally but the tendon reflexes could not be evoked, and the plantar reflexes were weak. The gait lacked power yet there was no typical paralysis and no total disturbance of peroneus, tibialis, or cruralis functions. Sensibility was normal for all qualities but there was moderate dysæsthesia of the lower legs.

At first these symptoms, especially the dysæsthesia, slowly improved, but they became acutely worse after the patient had taken one uliron tablet (0·5 g.) again on July 1st. The muscles of the calves were then extremely tender to pressure and there was œdema of the face. Again after 0·5 g. uliron, on the 8th, the symptoms became worse still. On the 15th all the tendon reflexes of the legs could be evoked and the gait was a little firmer. The strength of the muscles of the hands increased and the diaphragm moved normally. The subjective symptoms disappeared only very slowly, as did the facial œdema and the disturbances in swallowing and taste. When the patient left hospital (July 30th) they had not entirely gone. Recovery in course of time may, however, be expected as well as improvement of the paresis of the crural muscles.

From the beginning the diagnosis of polyneuritis was apparent and there were grounds for suspecting a deficiency of vitamin B_1 (hence the administration of Betabion Forte, which seemed to bring about obvious improvement), but uliron seemed to us the cause of this illness. This suspicion was confirmed when the symptoms became worse on two occasions after taking 0·5 g. and after reading of other instances.

The symptoms of this patient are rather different from those in previous reports. The patient's story of fatigue and fever is not unusual, nor is the history of paresis of the bowel. In the previously reported cases there was no objective disturbance of sensibility and the disease generally became apparent in the tibial and peroneal nerves and occasionally in the radial nerve and usually caused some atrophy of the

small muscles of the hand. In the present instance there was an extensive, highly disagreeable subjective disturbance of sensibility ("from head to foot") with facial swellings. The neuritis was felt in the upper as well as in the lower part of the legs but did not prevent a single movement. The slightly atrophic muscles of the hand were only moderately weak and all objective phenomena were beginning to disappear long before the subjective ones. Dryness of the mouth, loss of taste, and paresis of swallowing have not previously been reported. The toxic action of uliron has apparently an extensive zone of action in the body. It was not certain whether in our case, as in the one described by Bürger (1938), the initial violent pain in the lumbar region and the subsequent tenderness of the muscles of the calves should be considered an affection of the muscles (myositis) as visible signs of such an affection were lacking.

In the cases so far reported autonomous phenomena were observed only in the initial stages. In our patient they were very much in evidence as a feeling of exhaustion and as a disturbance in the distribution of fluid (in the face), together with dysæsthesia and paræsthesia. Taste and smell were eliminated in much the same way as after an attack of influenza and the slight difficulty in swallowing also finds its analogy in post-infectious states. The poisoning symptoms became evident at once after the use of 16 g. of uliron in the two periods with a week's interval. It is possible that these symptoms would have arisen even if the second dose of 6 g. had been omitted. In any case, the second dose of uliron made the symptoms worse.

It does not seem possible to determine the quantity of uliron necessary to cause polyneuritic symptoms. A predisposition of the patient must be important, as in so many other instances of poisoning by remedies. It may be that the predisposition in this patient was a vitamin-B_1 deficiency; the patient's diet at least gave ample grounds for this supposition.

SUMMARY

A man of 63 developed polyneuritis after taking 16 g. of uliron. Paræsthesia, dysæsthesia, and signs of autonomic disturbance characterised the illness more than the neuromuscular phenomena usually reported in such cases. It is thought that a predisposition—in this case possibly vitamin-B_1 deficiency—may be favourable to the incidence of the complication.

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MEDICAL SOCIETIES

ROYAL SOCIETY OF MEDICINE

SECTION OF THERAPEUTICS AND PHARMACOLOGY

AT a meeting of this section held on Oct. 11th, Sir FREDERICK BANTING, F.R.S., delivered the W. E. Dixon memorial lecture on

Resistance to Experimental Cancer

He said that although at present there was nothing to offer in the way of a specific therapeutic agent for cancer progress towards this end was being made. It was better not to use the word "immunity" until cancer in general had been proved to be due to a living agent; he preferred the term "resistance." An immense amount of work had been done on the regression of experimental tumours and its possible causes. Early work had shown clearly that the origin, age, incidence, clinical course and modes of growth, infiltration and formation of metastases were identical in man and animals. From the aspect of resistance chemically induced tumours did not differ from spontaneous tumours. The Rous sarcoma, known to be due to a virus, was identical with mammalian tumours in its marked species specificity, malignant invasion of normal tissues, and metastases, differing only in respect of the possibility of transmitting it by means of a virus. Sir Frederick summarised the work done on experimental cancer during the last 50 years and paid special tribute to the observations made by the scientific staff of the Imperial Cancer Research Fund. He then gave a brief account of the studies made on the Rous sarcoma since 1926 in his own laboratory. The chickens used were from 6 to 12 months old and transplants were made into from 3 to 6 normal chickens every week, in order to maintain a constant supply of tumour tissue for experimental purposes. Between 1928 and 1934 inclusive, transplants had been made into 1768 chickens: 621 had been killed to obtain tumour tissue, 1140 had died, and 7, that is 1 bird in 164, had become resistant. A resistant bird was one in which a well-established tumour regressed; if a second, small tumour developed on additional transplantation, this also regressed. The bird did not develop tumours on subsequent transplantations, and did not die of tumour. During the past ten years about 1 bird in 50 had shown some signs of resistance; 44 birds had received more than 5—and sometimes more than 40—direct transplants and had remained negative. A fowl might be resistant to cell-free filtrate but not to transplanted cells; 13 birds which had remained negative to cell-free extract had developed tumours and died when inoculated with Rous cells. There was a very marked variation in the degree of resistance; some birds had a very slow-growing tumour in one breast and were resistant to tumour extract or cell-inoculation in the other breast; sometimes a tumour would develop and regress after many transplantations; occasionally a direct transplant or injection in one breast would cause rapid growth of an almost extinct tumour in the other breast.

The size of the transplant had an important bearing on the result, but a highly resistant bird could overcome enormous numbers of tumour cells. The manner of regression varied with the type of tumour. The first signs of regression were often found in the appearance of the bird: its comb became red and it gained in weight and activity, even though the tumour was still quite large. It was early found that plasma of Rous-resistant birds neutralised the cell-free active filtrate of a Rous tumour. Over 40 experiments of this kind had been carried out and no tumour had resulted. Normal bird-plasma had no such neutralising effect. As little as 0·1 c.cm. of plasma would completely neutralise 1 c.cm. of potent extract. Treatment had no effect once a tumour had started. It appeared therefore that the virus was within the cancer cell and not affected by the antibodies of the blood.

In an attempt to ascertain whether in a resistant

bird the cells died from lack of blood-supply or were killed by antibodies, transplants of Rous cells in sacs made from fresh hen peritoneum were placed in the breast muscles of resistant birds, removed at intervals of ten days, and immediately grafted into the muscle of normal birds. Of 20 sac grafts which had remained in resistant birds for more than 48 hours, only 1, and of 6 removed in 48 hours or less, only 2, produced tumours. It appeared therefore that concentrated immune serum had a lethal effect on the tumour cell.

When immune bird plasma was mixed with tumour extract and injected immediately into 3 birds, 1 or 2 always developed a tumour, suggesting that immune plasma required time for the neutralisation of the virus. Experiments with an incubated mixture of equal parts of immune plasma and tumour extract showed that neutralisation took place in the test-tube during incubation. To protect a bird against the injection of 1 c.cm. of potent tumour extract in vivo, it was necessary to give approximately 30 c.cm. of resistant plasma, an amount which would more than neutralise 300 c.cm. of the same extract in vitro. The plasma injected into the body was apparently diluted by the blood and body fluids. Resistant plasma was ineffective against transplants of tumour cells. All the tissues of a resistant bird appeared to be resistant both to cell-free filtrate and to Rous tumour cells. Extracts of liver neutralised tumour extracts as completely as resistant serum; extracts of muscle and kidney were less effective.

The Fujinami tumour, available since 1933, was a myxosarcoma, originally discovered in a chicken, which could be propagated through fowls and ducks. It showed a much greater tendency to regress, and thus confer resistance, than did the Rous sarcoma. There seemed to be a similar variation in the degree of immunity to the two tumours. Two Rous-resistant birds had been given an extract of dried Fujinami powder; both developed large tumours and secondaries in the lungs and died, but the plasma of both birds after death still completely neutralised the Rous extract. Similarly, the plasma of a Fujinami-resistant bird would neutralise Fujinami cell-free extract but would not neutralise Rous extract. A high degree of resistance to Rous tumour did not protect the bird against the development of a dibenzanthracene tumour.

It was important in the study of immunity in Rous tumours to know the type of cell in which the virus grew. Carrel had believed that the monocyte gave rise to Rous tumour. Since monocytes alone wandered out of the blood into the alveoli of the lung, an attempt was made to induce lung tumours by introducing potent tumour extract with added kaolin through a soft rubber catheter into the trachea at its bifurcation; 14 out of 15 birds died of massive lung tumours, and 4 out of 12 developed tumours in experiments when kaolin was not added. The experiments indicated that monocytes took up the virus and carried it into the lung tissue. Sir Frederick added that the histological appearance of early miliary tumours of the lung suggested that the monocyte itself was the cell that underwent malignant transformation.

Birds with slowly growing tumours sometimes had an exudation of fluid under the skin overlying the tumour. This fluid had a neutralising effect, when added to tumour extract, equivalent to that of resistant serum. In 3 birds extensively studied the tumour cells were not affected by the immune fluid because the virus was within the protecting cell. Many vain attempts had been made to produce active immunity to Rous sarcoma. After repeated injections of neutralised or partially neutralised serum-tumour extract mixtures a few birds had become resistant or partially resistant. Since the potency of a tumour extract could not be predicted the amount of serum necessary to neutralise it could not be calculated. After many failures to produce constantly even minor degrees of resistance, a series of experiments was designed to kill the tumour cell by physiological means so that the hypothetical antigenic properties might remain. Ammonia, and also glyceric aldehyde in weak solution, had been tried for this purpose but the results to date were not sufficiently encouraging to justify further work on these lines.

A study had also been made of resistance in mice tumours. Spontaneous regression had been encountered with certain tumours; during two years transplants of one of them had been made in 1216 mice, and 85 (1 in 14) had become resistant. With another tumour, 1 in 114 mice had become resistant. Of all experimental mouse tumours, Balogh was perhaps the most malignant and was comparable to the Rous tumour in chickens. The experiments described with chickens had been tried also with the Balogh tumour in mice, and a small number in each group had shown some degree of resistance, but for the most part the results had been unsatisfactory. Dr. Franks was approaching the problem from an entirely different angle, seeking to immunise the mice against dibenzanthracene tumours by the repeated administration of dibenzanthracene which had been rendered antigenic by linking it with a protein. It was as yet too early to predict the results of this experiment.

The balance of evidence suggested that "resistance," or refractoriness to the grafting of cells, was a laboratory phenomenon unrelated to the realities of natural spontaneous cancer. It might simply indicate a reaction between host and tumour cell where there was a difference in genetic constitution of host and cell. If this were the complete explanation of resistance, the forces which destroyed a transplanted tumour could scarcely ever operate in natural cancer in which the malignant cells had necessarily the same genetic constitution as the host. In some of the experiments recorded, however, there lurked the possibility that the forces which effectively rid an animal of a spontaneous tumour might be a combination of anticellular and antiviral immune bodies. Antigenic differences between host and malignant tissues might be sufficiently great to stimulate curative antibodies adequate to ensure the disappearance of even spontaneous cancers. It was along these lines that the greatest hope for cancer therapy lay.

SECTION OF PSYCHIATRY

AT the opening meeting of this section held on Oct. 11th, Dr. H. CRICHTON-MILLER delivered his presidential address on

Resultant and Purposive in Psychiatry

He said he felt that the supreme need of psychiatry was the coördination of biological and psychological views. An increasing volume of research proceeded on these two lines, but they never met. No psychopathologist would bring himself to refer to Alzheimer cells; no biologist could mention an œdipus complex. Yet in most, if not in all, patients such factors coexisted. The president agreed with Dr. Aubrey Lewis that in the present state of our knowledge the psychiatrist must deny himself the ease of a

simple classification; it was a deceptive ease and a deceptive simplicity. Most clinicians found the identity that science sought to establish more alluring than the diversity that life presented. They would accept a false causality in preference to a vague conditionalism.

One aspect of multiple ætiology was the synergy whereby any resultant factor, whether organic or psychic, reinforced or was reinforced by a purposive or conative factor. A "resultant" Dr. Crichton-Miller defined as any deviation from the normal which could reasonably be regarded as the manifestation of inherited characteristics or as the reaction of the organism to environment—e.g., a toxicosis or an anxiety proportionate to the stimulus. Every symptom that might be regarded as serving an end could be classed as purposive, such as hysteria and most hypochondria. Freud had contributed a new and disturbing outlook on the teleological factor in many symptoms previously accepted as resultant. This outlook had accentuated the contrast between the biogenic and psychogenic factors, and had induced a defence reaction in the biogenic school whereby the doctrine of somatogenesis was defended with a zeal that at times was paranoid.

In the "Psychopathology of Everyday Life" Freud had described two concurrent causal series. His attacks of migraine were marked by the forgetting of names, and his explanation was that, suffering from exhaustion, circulatory disturbance, and intoxication, he was robbed by an unknown psychic force of the disposal of proper names belonging to his memory. This was, he said, the same force as in another person might bring about the same failure of memory during perfect health. The migraine was not the only cause, any more than the darkness and loneliness of a suburb might be the cause of the robbery of a foot-passenger. One of the series was psychic and the other was organic, and the organic sequence reinforced the psychic. The instance exemplified a very large proportion of psychiatric cases, for in it the synergy was between an organic and a purposive ætiology.

Psychiatrists had no assurance that they knew the origin of migraine, or that its origin was purely organic. Freud claimed that an affective determinant could be established in every case; many would not accept this claim. Enuresis was also said to have a psychological causality, but many organic factors might reinforce love and hate. Dr. Crichton-Miller had cured a soldier with thyroid; he also recalled a case in a boy of fourteen whose mother did not want him to go to boarding-school and who did not want to go himself. In considering how far a purposive mechanism might coexist with a non-purposive one, it was necessary to recognise the curative successes of many observers. A small boy might be suffering from thread-worms and at the same time be expressing a longing to return to the uterus; an involutional melancholic might suffer from bacilluria and at the same time express a protest against the demands of normal life. The possibility, if not the probability, of such cases of multiple ætiology must be admitted. Dr. Crichton-Miller submitted that in such a condition as nocturnal enuresis there was constant interplay between organic and psychic factors. For instance, an early Fröhlich case might display a variety of behaviour anomalies that served to defend his ego, until he found that a series of nocturnal "accidents" fulfilled adequately the purposes of defence; thereafter his behaviour might become more normal in other respects. It mattered greatly to the psychiatrist whether he based his therapy upon the tacit assumption that the organic process was autonomous or that the psychic process was self-contained, rather than remaining sensitive to the constant possibility of interaction between simultaneous mechanisms.

To take another example, Ernest Jones expressed the Freudian view in the sweeping formula: "An attack of the nightmare is an expression of a mental conflict over an incestuous desire." Jones quoted numerous organic factors suggested as causes under the two heads of sources of peripheral irritation and mechanical sources of embarrassment to the circulation and respiration. He appeared merely to recognise the existence of possible existing stimuli in relation to the constant purposive factor represented by the incest complex. Most psychiatrists would see in the organic explanations more significance than the "kernel of truth" which Jones attributed to them. In Dr. Crichton-Miller's experience, most nightmares were the result of somatic disturbance while their content emerged from conative and affective patterns of the psyche. The gaps in knowledge of cerebral function and metabolism left the ætiology of the nightmare so vague as to invite a certain unwarranted assurance in the claims of the psycho-analyst.

Turning to the war neuroses, Dr. Crichton-Miller said that the original term "shell-shock" had done a great deal of harm by implying a single ætiology which was acceptable to the popular mind and still more acceptable to the war-neurotic himself. Nott had pointed out the difference between emotio and commotio cerebri—the neurological results of air-concussion, and the fear mechanism. Other authorities had not shared his stereoscopic vision, and had distinguished between concussional and emotional types of case. There had been little exact evaluation of causative factors. Yet the war had provided thousands of cases in which physical factors—e.g., air-concussion, focal sepsis, and endocrine exhaustion—coexisted with fear. The baffling element in the diagnosis was to evaluate the purposive factor of escape and assess the degree to which it was conscious or unconscious. McDougall had declared that the important thing was to realise the intimate and constant action and reaction between mind and body, and their reciprocal dependence for all healthy living. Riddoch had pointed out the connexion between anxiety neurosis and disordered action of the heart. Dr. Crichton-Miller said he would like to think that in some future war the profession would be so sure of its ground as to apply to each war neurotic specific questions concerning the possible synergy of organic and psychic factors, of resultant and purposive mechanisms. Prof. Edward Mapother had pointed out the interaction between anxiety neurosis and hysteria—resultant and purposive factors—in the war neurosis, and had depreciated the value of psychotherapy, or, as he termed it, of "psychological rabbiting." Dr. Crichton-Miller suggested that, if the psychological factors were so difficult for the trained observer to differentiate, they were much more obscure to the patient, and in expert hands "psychological rabbiting" could not be decried as useless in its application to the war neurosis. What was true of the war neurosis was also true of the neurotic disabilities of civilian life. At every point disability, whether resulting from biological or affective causes, was liable to be pressed into service as a personal aim. Whether that aim was conscious or repressed mattered little. What mattered to the psychiatrist was that with most of his patients the past and the future were continually in mesh, and

no real advance could be made in psychiatry except by those who were sensitive to this constant interaction.

MANCHESTER MEDICAL SOCIETY

AT a meeting of this society held on Oct. 5th, Prof. H. S. RAPER, F.R.S., delivered his presidential address on

Some Biochemical Aspects of Growth

The problems of growth, he said, are in part biochemical, since fundamentally the process involves the synthesis of new living matter. Contributions to the subject have come from very varied quarters during the present century, and all have shed some light on it. Studies of the material basis of growth in animals have shown that new protoplasm can only be produced if certain amino-acids are provided. The presence of these "essential" amino-acids in dietary proteins has been made the basis of important recommendations as to the minimum protein requirements in human nutrition.

The use of X rays in the investigation of protein structure has already revealed something of the architecture of the protein molecule, and since protein seems to be the essential basis of protoplasm, this knowledge is valuable to the biochemist in seeking for the mechanism of protein synthesis in the living cell. A fascinating field for the study of protein synthesis has been opened by the discovery of crystalline virus proteins. These are able to multiply automatically inside plant tissues and probably represent the most elementary process of growth yet known.

Many substances have now been discovered which may be classified as growth stimulants. Some, like certain of the vitamins, the growth hormone of the anterior-pituitary gland and the growth-promoting substance present in embryonic tissues, have a general effect. So far as can be seen at the present time they play the rôle of catalyst in promoting the synthesis of new living material, though it is possible that some of them may be essential components of protoplasm. Other growth stimulants are more specific and appear to act only on certain types of cell. In this category come those sex hormones which are responsible for the development of secondary sex characters and for changes in the sex organs which occur during œstrus and pregnancy. The actions of these substances are allied to those which have been shown to play a part in the differentiation which occurs in the embryo. It seems likely that this action is truly catalytic because it can be imitated, in some instances almost exactly, by synthetic chemical agents which are not allied in structure to the naturally occurring hormones.

The fact that many bacteria will grow and multiply in an inorganic medium if a suitable source of carbon is supplied suggests at first sight that growth promoters are not essential to them. What is more likely, however, is that such organisms are able to synthesise all they require from the elementary substances supplied and these include growth stimulants, because it has been conclusively shown that bacteria which will not grow in such media grow well if certain substances are provided in small amount. The addenda required comprise vitamins—particularly of the B group—unknown substances present in animal tissues, and certain amino-acids. The study of plant growth has also received a new impetus from the discovery of auxins, which may be styled plant growth hormones. They are present at growing points in the plant and are probably growth catalysts, since their action may be largely imitated by synthetic organic compounds of quite a different nature.

A survey of the various fields of study in which the biochemical aspects of growth are being investigated, in Prof. Raper's view, gives good grounds for the expectation of a much clearer understanding of the process.

VISITORS FROM CHILE AND THE ARGENTINE

A PARTY of Chilean and Argentine doctors have been spending a fortnight in this country as guests of the British Council, working through a programme arranged for them by the Royal Society of Medicine. The doctors, who arrived on Oct. 3rd after a tour in Germany, were chosen by the University of Chile or by the Argentine Government, and are as follows: *From Chile:* Prof. Santiago Calderon (clinical radiology); Dr. Carlos Carvajal (radiology); Dr. Jorge Castor (gynæcology); Dr. Fernando Cruz (tuberculosis); Dr. Gustavo Fricke (children's diseases); Dr. Anibal Grez (otology); Dr. Rafael Lorca (internal medicine); Dr. Alfredo Mackel (surgery); Dr. Alejandro Ovalle (cancer and radiotherapy); Dr. Domingo Urrutia (internal medicine); Dr. Manuel Volochinsky (gynæcology). *From the Argentine:* Dr. Lopez Bullo; Dr. Carlos Sylva.

In their first week the party were received by Sir Arthur MacNalty at the Ministry of Health, where our national health services were explained to them, at the Royal Society of Medicine, and at the Royal College of Surgeons. The London County Council showed them a little of the organisation of their children's and fever hospitals, sanatoria, the school health services, housing, and group laboratory and ambulance services, and the party visited the Police College and Criminal Medical Research Laboratories at Hendon, and Papworth Village Settlement.

The second week's programme included visits to the London School of Hygiene and Tropical Medicine and to Queen Charlotte's isolation block, the Royal Masonic Hospital, and the Wellcome Research Institution. Demonstrations were arranged of ear, nose, and throat work at St. Thomas's, of radiological diagnosis at the Middlesex, of the cardiac work being done at University College Hospital by Sir Thomas Lewis for the Medical Research Council, and of radium-bomb and other cancer treatment at Fulham. They were able to see some thoracic surgery at the Brompton Hospital and St. Mary Abbots, and special demonstrations were given at Queen Charlotte's and St. Bartholomew's. The party spent whole days at Cambridge and at the new Hospital Centre at Birmingham, and in between they were invited to inspect the Bank of England, the Zoological Gardens, and Broadcasting House. They also attended the installation of the Master of the Society of Apothecaries.

It is something that neither hosts nor guests were dissuaded from these excellent contacts by the disruptive forces of the time. Only a small section of the party cut short their visit to make sure of an uneventful return home.

ROYAL SANITARY INSTITUTE.—A meeting of the institute will be held in the Dorothy Café, Sidney-street, Cambridge, on Friday, Nov. 4th, at 5 P.M., when Mr. R. D. Tompkins, Ph.D., of the low-temperature research station of the Department of Scientific and Industrial Research, will give an address on recent work in food preservation. Dr. W. H. Bradley, research assistant in the department of medicine of the University of Cambridge, will open a discussion on the prevention of droplet infection, with special reference to streptococcal disease.

REVIEWS AND NOTICES OF BOOKS

The Foot

Second edition. By NORMAN C. LAKE, M.D., M.S., D.Sc. Lond., F.R.C.S., Senior Surgeon and Lecturer on Surgery, Charing Cross Hospital. London: Baillière, Tindall and Cox. 1938. Pp. 366. 12*s.* 6*d.*

THE foot, its evolutionary history, its sufferings at the hands (or rather the foot-wear) of man, and its diseases are a small but complete cross-section of the whole of medicine. The man who takes an intelligent interest in the foot cannot ignore certain aspects of anatomy and embryology—he must know something about medicine (arterio-sclerosis, diabetes, tabes, and poliomyelitis, to name only some of the best-known causes of foot trouble) and he must be a good surgeon. This book is an excellent guide to a fascinating subject. Mr. Norman Lake takes seriously the disabilities and diseases of the foot. He has moreover a mind of his own—for example, he challenges firmly the view that muscle tone is the only thing that matters in the ætiology of flat-foot—but he has not ignored suggestions made by reviewers of the first edition of the book. He has also been at some pains to incorporate recent advances in knowledge, notably Morton's anatomical work and Denis Browne's views on club-foot. There now seems a reasonable prospect of something being done about the rationalisation of foot-wear. Not so long ago there was a lively spate of letters on feet and foot-wear in both medical and lay papers, and there is evidently a growing desire to take action against that twentieth-century descendant of tight lacing—the physiologically unsound shoe.

Anæsthesia and Analgesia

By J. K. WATSON, M.D. Edin. Bristol: John Wright and Sons; London: Simpkin Marshall. 1938. Pp. 135. 3*s.* 6*d.*

IN the preface the hope is expressed that this book, intended for nurses and midwives, may also be of interest to the junior medical practitioner, the dental surgeon, and possibly those lay people who are interested in the subject of the provision for anæsthesia for women during normal labour. Unfortunately Dr. Watson has tried to cover too much ground in a short space. Almost all the known methods of anæsthesia and analgesia, both current and obsolete, are mentioned, and the result tends to resemble a catalogue of methods rather than a practical handbook. Most of them are described clearly and their uses are well defined. It is difficult, however, to understand the recommendation that chloral and bromide should be dissolved in saline before they are given per rectum: the addition of the sodium chloride will delay rather than help the absorption of these drugs. In the discussion of analgesia in labour, 3½ pages are devoted to Avertin (which is seldom used for this purpose) while no reference is made to the ether-oil method of Gwathmey or to the barbiturates. The section on "twilight sleep" is marred by a printer's error which obscures the dosage of the drugs. Gas-air analgesia by the "Queen Charlotte's" machine is given prominence, but it would have been fitting to note the name of Minnitt as a pioneer in this field. Chassar Moir's method of repeated inhalations of a limited quantity of pure gas is not mentioned. On page 43 is a more serious error. Though the text gives a warning of the precautions to be taken with this apparatus, Junker's inhaler is illustrated with the tubing connected in a way which, but for the safety valve, would result in the patient receiving a jet of liquid chloroform in the face. On the whole, however, the illustrations are good, and the instruments necessary for the various procedures are described with precision, while the legal position of the surgeon, anæsthetist, and nursing staff is ably discussed. This book cannot be recommended as a guide for the practice of anæsthesia, but it provides a useful bird's-eye view of methods of anæsthesia and analgesia.

Malaria in the Netherlands

By N. H. SWELLENGREBEL and A. DE BUCK. London: Baillière, Tindall and Cox. 1938. Pp. 267. 10*s.* 6*d.*

ALTHOUGH the authors lament the gaps in our knowledge of malaria as the infection shows itself in the Netherlands, their book tells how many of them have been filled of late and what hopeful signs of future progress can now be seen. Under the name *Anopheles maculipennis* there are in the Netherlands two taxonomic units, a long-winged paucidentate and a short-winged multidentate group. In nature each group oviposits with equal readiness in fresh open water and in this medium the larval stages of both thrive well; and in the Netherlands such freshness is characteristic of land laid down by nature. But where, from the sea, man has reclaimed land necessarily permeated by salt, the salt content of water on it is high at first. When this lessens and, while on land now habitable and useful for agriculture, it still has a salt content of over 0·25 per cent., nearly all the eggs (98 per cent.) and larvæ (99 per cent.) recovered from it by dipping are those of shortwings. Moreover, shortwings are the essential malaria carriers of the Netherlands; malarial infection has proved more than 100 times as common in them as in the longwings. In other words, man has reclaimed land and by so doing has favoured shortwings and has spread malaria in the country.

This malaria is essentially conveyed as the result of change in the mode of life which the shortwings have adopted. For example, when in August *A. maculipennis* ceases to reproduce, the long-winged forms cease to feed and so prepare for hibernation. The shortwings do not; they cannot live unless they feed and it is after reproduction ceases that they really begin to spread malaria by continuing to feed from time to time indiscriminately on healthy persons or on carriers. Thus in August their salivary glands are without sporozoits; in October 38 per cent. of those caught in one village showed living sporozoits, but though in January of the next year the same percentage had sporozoits these were all dead. This and other considerations show that man mostly acquires infection in the autumn, at a time when longwings do not feed, and that after a winter latency it manifests as illness in the spring. Although these two forms of *A. maculipennis* are in general looked on as races—the short-winged *A. m. atroparvus* and the long-winged *A. m. messeæ*—they behave as species in that cross-breeding results either in no progeny at all or in the production of unfertile mules.

The efforts to eradicate malaria from the Netherlands by reducing the salinity of open water on reclaimed land are happily favourable to farming which saltish water greatly handicaps. The barrage across the mouth of the Zuyder Zee has formed the

Yssel Lake, and the River Yssel is diluting the salt content of the lake's water till now it is no more than 0·03 per cent. In the part of the lake which has been reclaimed as the New Polder, the salinity of open water on its land is 1·32 per cent., far too high for breeding of shortwings; this suggests that, as sea salt gradually soaks out of the soil into open moving water and this latter finally receives no more salt and becomes fresh, there will come an intermediate period when its salinity will suit shortwing breeding and when malaria will increase. So impressive, however, is the evidence set out in this book of close attention to these and other aspects of the problem that we can feel sure that this phase must have already been considered by workers in the Netherlands. Their work, which includes suggestions for preventive measures immediately applicable, is an example of what intensive local study can do.

Diseases of the Nose, Throat and Ear

Seventh edition. By W. L. BALLENGER, M.D., F.A.C.S., late Professor of Otology, Rhinology, and Laryngology, University of Illinois, Chicago; and H. C. BALLENGER, M.D., F.A.C.S., Assistant Professor of Otolaryngology, Northwestern University, Chicago. London: Henry Kimpton. 1938. Pp. 1030. 50*s*.

THIS work has been carefully revised. Benign neoplasms of the nose, throat, and larynx are now described together in one chapter, and malignant neoplasms of these regions in another. The chapters on peroral endoscopy have been brought up to date by Gabriel Tucker and C. L. Jackson, and the latter has rewritten the section on gastroscopy; J. M. West gives an account of his method of dacryocystostomy and Alfred Levy has made certain changes in his articles on the physiology and functional testing of the labyrinth.

More critical editing of the book as a whole would eliminate some inconsistencies. The notes on physical methods of treatment are too perfunctory to be of help in practice and do not always agree with the statements made later in the chapters on the treatment of individual diseases; for example, in one place the results of ionisation in hay-fever are said to be disappointing, in another to bring about disappearance or at least relief of symptoms in many cases. Operations such as tonsillectomy which come within the scope of the practitioner are fully described (though any useful discussion of post-operative hæmorrhage is wanting), while laryngofissure and laryngectomy are dealt with in a more cursory way. Some account of the usual methods of examination of the various regions would have been useful in a book designed chiefly for the general practitioner, who will, however, find here most of the information he needs.

The People's Food

By Sir WILLIAM CRAWFORD, K.B.E., and H. BROADLEY. London: William Heinemann. Pp. 336. 12*s*. 6*d*.

Sir William Crawford and Mr. Broadley have made a study of how the different social groups in this country take their food; what they eat, where they do their shopping, and how they space their meals. For this purpose they ascertained by inquiry the food budget of 5000 families over the winter months 1936–37, choosing representative urban districts in which living was good, less good, and definitely bad, and including in each district an adequate number of families whose income placed them within the five social grades now generally accepted for marketing inquiries. The numbers were considered sufficient to show what happens inside any one social class when the individual share rises owing to the family being small and its responsibilities few. The authors have transferred their results to a series of simple but highly ingenious graphs, on each of which is charted as a background the per-caput income in shillings per week for each class of the population, and within each class the income of the grades adopted by Sir John Orr in Food, Health, and Income. This method has the remarkable result of establishing the proportion of individuals in each group above and below the norm, and the method shows to particular advantage in the eight charts entitled Calories, Proteins, Phosphorus, Calcium, Iron, Vitamin A, Vitamin B_1, and Vitamin C, on pages 156–157, where the norm is drawn at the level suggested by (1) the B.M.A., (2) Stieveling, (3) the League of Nations Technical Commission.

The primary object of the survey is to advise the business world of coming changes in food consumption. To Sir William Crawford, as a practitioner in advertising, present deficiencies are only the measure of future demands and although the basic diet prescribed by the League of Nations may not become the established diet of the people for many years to come, nevertheless the trend of progress will be continually towards its achievement. Looking back over the last hundred years he finds the progress recorded has been so great that this forecast represents but a few more steps along the same road. The book itself contains a great deal of information set out with consummate skill, but perhaps its greatest interest at the moment lies in the quiet assumption that producers and consumers alike must turn their minds to the certainty of the coming change. The national diet is to be adequate; the advertising practitioner has joined the other practitioners in saying so. The first problem is his, for it lies not in the laboratory nor even in the economic field, but in the task of educating the people to the importance of proper diet.

Thus We Are Men

By Sir WALTER LANGDON-BROWN, M.A., M.D. Cantab., F.R.C.P., Emeritus Professor of Physic and Fellow of Corpus Christi College in the University of Cambridge; Consulting Physician to St. Bartholomew's Hospital. London: Kegan Paul, Trench, Trubner and Co. 1938. Pp. 344. 10*s*. 6*d*.

THESE collected addresses, delivered for the most part on important occasions or to learned societies, display a diversity of cultural interests all too rare among doctors. The main theme, as set forth in the introduction and elaborated in the first address, is that "as we are animals we conform to biological laws. Our further evolution physically is improbable and mentally unlikely. Therefore only a psychological evolution remains." To develop psychologically—and few will deny the urgent need for such development—we must first understand ourselves; this, in the author's opinion, is to be achieved by analysing the content of the unconscious mind and by the study of works of creative imagination. One of the most fascinating variations on this theme is the address entitled Myth, Phantasy, and Mary Rose in which "the curse of mother-fixation, which may make an artist, but never a man" is shown to have shaped Barrie's mental attitude to life and so coloured his writings. Another timely address is that on Some Gods and Their Makers. Here the author, accepting Samuel Butler's inversion of Pope's aphorism, "an honest God is the noblest

work of man," concludes that every nation has the God it deserves.

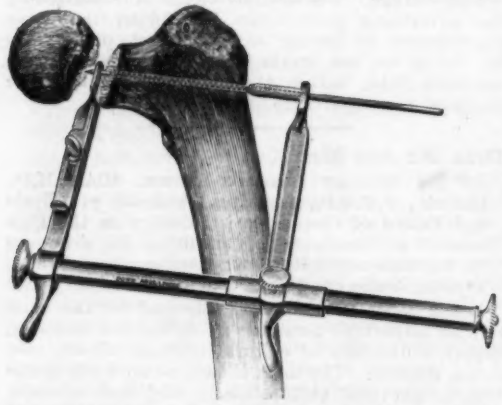
It has been said that when a man's mind becomes too inelastic to receive and examine new ideas he is virtually dead without knowing it. Sir Walter Langdon-Brown, though already a consulting physician and, as such, "holding a position of great dignity but of no importance," shows once again in this book that he is not only very much alive in this sense but that his philosophy has a stimulating quality which is essentially that of youth. This is no "bedside book" for casual reading. The reflective reader will find that it deserves and demands close attention.

NEW INVENTIONS

A SIMPLIFIED METHOD OF INTRODUCING THE SMITH-PETERSEN PIN

IN making a further addition to the many instruments invented to facilitate the introduction of a Smith-Petersen pin I must plead in extenuation that this instrument has the distinction of being employed in the open and not the so-called blind operation. The open operation produces a more exact reposition of the fragments of the fractured neck of the femur, and is in general speedier, having really only one serious drawback, the trauma inflicted and the consequent danger of sepsis. The somewhat extensive approaches employed to reveal the fractured site are made necessary by the difficulty of achieving correct alignment of the Smith-Petersen pin, and if the incision can be greatly reduced, there will be little difference between the amount of shock in the two operations, provided the insertion of the pin is not made more difficult.

The new instrument consists of a square-cut cross-bar (see Figure) to one end of which is attached a fixed vertical bar terminating in a flattened elliptical serrated blade, with a central hole which will comfortably receive the Watson Jones guide pin. A mark



cut in the proximal portion of the blade, 9/16 in. from the hole, indicates the distance it should be inserted in average cases, and there is an adjustable stop which prevents slipping and allows for cases where the diameter of the neck differs from the average. The cross-bar also carries a movable bar which can be firmly fixed in the desired position by a thumb screw. At the distal end of the moving bar there is a pointed cylindrical portion, 1 in. long, hollowed out so as just to allow the passage of the Watson Jones guide pin. The lengths of the two arms are so arranged that the guide pin, when inserted through the cylindrical holder and advanced, will penetrate the hole in the bladed portion. The two arms are extended beyond the carrier bar to facilitate steadying the instrument, which can be easily dismantled at the appropriate stage of the operation.

The advantages claimed for this instrument are first its simplicity and low cost. It was in fact converted originally from part of a self-retaining abdominal retractor, and it differs from other somewhat similar instruments in requiring no abstruse mathematical calculations and no special mobile X ray plant. Once the fracture is diagnosed, a radiogram is for all practical purposes a luxury. Furthermore the incision required is the simple anterior approach to the hip-joint, and its extent only about 4½ in. The anæsthesia employed has been a low spinal involving the minimum amount of Percaine to produce full relaxation of the musculature of the injured limb. An orthopædic table has been found unnecessary and the leg can be efficiently manipulated by an intelligent nurse. Abduction and inversion with mild extension invariably aligns the fragments and, when this has been proved possible, the limb is everted so as to make the fracture line gape sufficiently to insert the serrated blade centrally as far as the pre-arranged stop. A small incision below the outer aspect of the great trochanter then allows for adjustment of the cylindrical portion in the required position.

Once the two arms are in the correct position, all joints are firmly fixed by tightening the appropriate nuts. This is important for otherwise the guide pin will not pass in the desired direction. The fracture is next aligned by suitable inversion and abduction under vision, and this manœuvre jams the blade firmly enough to make it scarcely necessary for the assistant to maintain a very firm grasp of the handles. The guide pin is next drilled through to the appropriate distance. Its passage through the hole is generally perceived by the sensation this gives to the driller, and this fact can be readily verified by gently attempting to move the blade. It is usually necessary to withdraw the guide pin a little to free the blade and at this stage the instrument is dismantled, leaving the guide pin in situ. The fragments are again approximated and the guide driven into the head. The method employed in gauging the distance required has been to estimate the proportion of the head to the neck by a previous radiogram, and a simple calculation then indicates how much further the guide should penetrate the head. A duplicate guide laid alongside the projecting portion of the inserted one gives the length of Smith-Petersen pin desirable. The latter is now inserted over the guide in the usual way, the guide withdrawn, the limb tested for movements, and the wound closed. A radiogram may be taken for confirmation, but the method is so exact that this is not really necessary.

Without haste and with a rigid "no touch" technique the operation takes less than 45 minutes, a time that could be well shortened if the necessity arose, and one can be sure that the pin is in its correct position.

The instrument is made by Messrs. Down Bros. Ltd., of St. Thomas's-street, S.E.1, who have full specifications.

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THE LANCET

LONDON: SATURDAY, OCTOBER 15, 1938

MORTALITY BY OCCUPATION AND SOCIAL CLASS

THE average man's views on the relative effects of hard living or of easy circumstances on health and longevity tend to be coloured by his political prejudice; and this applies also to his impression of the occupational risk of certain trades. Even those most distrustful of statistical argument, however, will admit that ultimately those questions can only be decided on impartial analysis of actual records. The study of occupational mortality in 1930–32, summarised on another page, does not, of course, make light reading, but gives a more intelligible and fascinating survey of the social and occupational factors in mortality, of the special diseases of poverty and affluence than most people could imagine possible in any blue book. The report goes into one aspect of the question quite untouched by its predecessors. The latter were confined to the study of the mortality of males in different occupational and social groups; the present inquiry has been extended to the mortality of the wives of men differently employed, and to some extent of single women employed in various ways. The importance of this step is obvious; it should enable the effects of specific occupational hazard run by the males only to be differentiated more clearly from the general economic and environmental influences which they share with their wives. For example, an excess of cancer mortality in the different groups of makers of paper and paper goods and the absence of any such excess amongst their wives raises the question of an occupational causation. On the other hand, mortality from cancer of the skin increases as one passes down the social scale not only for men but for married women also, proving that occupational factors are not the only ones at issue. Again, the relatively high death-rate of physicians and surgeons from diseases of the digestive system is a calamity that is not shared by their wives. Much information on these lines is now made available for the first time. An important feature of the Registrar-General's previous occupational supplement (based upon the mortality of 1921–23) was the steep social gradient of male mortality. Mortality in the lowest social class was, it was found, nearly 50 per cent. above that of the highest social class. It is a cause for some satisfaction that this contrast was considerably less in 1930–32. In these years the relative excess of Class V over Class I was 23 per cent. in place of the previous 48. Married women, however, show a wider difference, Class I differing by 40 per cent. from Class V. It appears that though men and women show similar social gradients for diseases associated with poverty (which include tuberculosis, syphilitic diseases, cancer of all sites, bronchitis, and pneumonia), women are less affected than men by some of the diseases associated with affluence—namely, diabetes, cerebral vascular lesions, nephritis, and gall-stones. In short, the Registrar-General concludes, married women do not suffer the same penalties of a "comfortable" income (whether these have their origin in over-nutrition or a more sedentary life) as do men. The fact, however, that they suffer much the same penalties of an "uncomfortable" income clearly suggests that the social gradient of mortality is derived not so much from the immediate effects of the occupations of males as from the general environmental and economic conditions of life of both sexes. The striking contrasts revealed in the first two years of life can hardly fail to stir the social conscience. Although between 1921–23 and 1930–32 the legitimate infant mortality-rate of the country fell from 79 to 62 per 1000 live births, the range by social class changed very little. In both periods Social Class I had a rate only about half the national figure, while Class V had a rate some 25 per cent. in excess. Between the ages of 6 months and 2 years Class V has a mortality five times that of Class I, the death-rates from tuberculosis, whooping-cough and measles, bronchitis and pneumonia, diarrhœa and enteritis, all contributing to this gross excess. The Registrar-General as a contrast draws particular attention to the remarkably low infant death-rate in the families of officers of the defence forces—25 per 1000 live births. The corresponding figure for doctors was a little higher—30 per 1000—and for clergymen it was 36. At the other extreme come some of the occupational groups involved in mining, metal-working, and production of textiles, with rates lying between 80 and 100 per 1000. The reduction of these and other social differences referred to in the report is obviously a public health problem of great importance, and these statistics form most valuable indices of the many problems in urgent need of inquiry and attention. They should, and undoubtedly will be, considered not only by professional statisticians but also by health workers, and indeed by all who are interested in the public welfare.

ASPECTS OF DIABETES

DIABETES offers two kinds of problem to those who are attracted to its study. On the practical side, how can the management of diabetic patients be made simpler, safer, and more satisfactory? On the theoretical side, what really is the nature of the disturbance of carbohydrate metabolism that manifests itself in the familiar diabetic symptoms? Among the practical problems the search for a modified insulin with a prolonged action occupied various investigators for years. Dr. H. C. HAGEDORN of Copenhagen solved it brilliantly with his discovery in 1936 of the insoluble protamine insulin compound which could be

injected as a suspension to form a subcutaneous depôt; from this depôt insulin slowly dissolved and entered the circulation to exert its usual physiological action. The world was just beginning to use Hagedorn's preparation when Toronto, jealous, as it were, that any stranger should dare to improve on its own classic discovery, went one better with Scott and Fisher's zinc protamine insulin, whose action is still more prolonged than that of the Danish preparation. It was an unkind stroke of fate that took the lead from HAGEDORN so swiftly. The value of his work is fully appreciated by all who have watched or taken part in the race, and some of these have contributed a group of papers this autumn to a supplement (No. 90) of the *Acta Medica Scandinavica* dedicated to him and bearing his portrait. Only one of these contributions concerns itself with the more theoretical side of carbohydrate metabolism. E. J. KEPLER and R. M. WILDER of the Mayo Clinic draw attention to the work of LONG and LUKENS on the adrenal cortex. HOUSSAY'S demonstration that in various animal species the severity of pancreatectomy diabetes is greatly mitigated by hypophysectomy is now well known. LONG and LUKENS found that removal of the adrenal cortices has the same antidiabetic effect in these animals as hypophysectomy. They suggested that the pituitary might exert its effect on carbohydrate metabolism through the adrenal cortex. But later they succeeded in making the diabetic state reappear in adrenalectomised pancreatectomised animals by administering certain adrenal cortex preparations. That points to a coupled action of pituitary and cortical hormones rather than to an indirect action of the pituitary hormone mediated through stimulation of the adrenal. There the problem stands, with good evidence that both these glands play important rôles in normal carbohydrate metabolism, but with no clear picture of what these rôles and their relationships are. KEPLER and WILDER then turned to the clinical field to look again for signs of derangement of carbohydrate metabolism in disease of the adrenal cortex. They found that only a few of their cases of Addison's disease show hypoglycæmia, even in crisis, but they did not apparently determine whether the normal blood-sugar levels are accompanied by normal sugar-tolerance curves or by low flattened curves such as occur in pituitary insufficiency. Among 8 cases of proved adrenal cortical tumour they found 1 frankly diabetic and several others with abnormally high sugar-tolerance curves. The clinical evidence therefore gives support, scanty perhaps but not negligible, to the idea that the adrenal cortex is a factor to be reckoned with in carbohydrate metabolism—this in addition to its production of androgenic and œstrogenic substances and its influence on salt and water metabolism.

On the practical side there are many informative papers. J. TILLGREN and UNO CARLBORG record their difficulty, in certain severe complicated cases, in controlling the hyperglycæmia of the small hours of the morning. Even zinc protamine insulin has not been satisfactory and they have had recourse to an early morning dose of soluble insulin given at 4 or 5 A.M.; this has proved adequate, and at least for short periods not unduly disturbing to the patient. GEORGE GRAHAM describes his experience with mixtures of soluble insulin and protamine insulin (Hagedorn's preparation) given from a single syringe. As he said in his Lettsomian lectures,[1] he gives such mixtures, in varying proportions, once or twice daily, and in most of his severe cases obtains thereby a better control of glycosuria and hyperglycæmia than he has found possible with combinations of soluble and zinc protamine insulin. R. D. LAWRENCE supplies a more comprehensive account of his practice. He aims at treating as many of his diabetics as possible with one insulin injection a day. With mild cases it is easy; if they need insulin a moderate morning dose of zinc protamine insulin suffices. In more severe cases he combines soluble and zinc protamine insulin in the same syringe in a single morning dose. In the most severe cases he has to give a second dose, of soluble insulin, in the evening. Most of his insulin patients fall into those three groups, but a minority remains, where for varying reasons other modifications prove necessary. Both GRAHAM'S and LAWRENCE'S papers show that the criteria of good management of the diabetic have been changing. Ten years ago a well-treated case was expected to have a sugar-free urine and a blood-sugar concentration within normal limits throughout the twenty-four hours. Now GRAHAM describes patients who, when this ideal is carefully realised, feel miserable and suffer from lack of energy, depression, and severe headaches; when their insulin is reduced a little their previously normal blood-sugar rises, some glycosuria appears, and their sense of well-being returns. LAWRENCE finds that in severer cases, if he so adjusts the insulin dosage as to produce sugar-free urine for several whole days, troublesome hypoglycæmia due to unexplained fluctuations is almost sure to follow; he therefore aims at a balance in which transient glycosuria appears once or twice every day. The emphasis is therefore moving away from the biochemical to the clinical criteria of good treatment; a diabetic is well treated when he is free from symptoms, maintaining a reasonable weight, feeling well, and able to do his job in life safely and happily. But some anxious voice will ask whether recurring hyperglycæmia does not favour the development of the arch-complication of diabetes, arterio-sclerosis with its resulting retinitis, septic feet, and gangrene. Until the pathogenesis of arterio-sclerosis is discovered, this bogy will not be finally banished. But since the incidence of arterial change is much more closely related to the age of the diabetic than to the severity or the duration of his diabetes, and since the condition is common enough in the elderly non-diabetic, it is unlikely that diabetic changes are a major factor in its production. Both indeed may eventually be traced to some more deep-seated disorder; the present tendency is

[1] *Lancet*, 1938, 2, 1, 62, and 121.

to look for this in the pituitary. Arterio-sclerotic complications, however, are not unknown in the young diabetic. W. D. SANSUM, another contributor to this symposium, says they were mostly seen in the pre-insulin and early insulin days, and E. P. JOSLIN corroborates this. SANSUM had inclined to the theory, which other transatlantic authors have also favoured, that the hypercholesterolæmia of the untreated diabetic was responsible for them, but he has to admit that this thesis is far from being proved. At the same time he cites a group of 83 diabetic children, treated for eight years with high carbohydrate diets and insulin, in whom clinical evidence of arterio-sclerosis was absent, and he implies that the high carbohydrate diet has prevented arterio-sclerosis. LAWRENCE is much more sceptical about the existence of any special association between arterio-sclerosis and juvenile diabetes, and therefore also about the claims made for high carbohydrate-low fat diets. He has found clinical evidence of arterio-sclerosis in only one of 43 diabetic children after ten years of treatment, in spite of the facts that in the earlier stages their diets were often low in carbohydrate and high in fat, and that their treatment throughout has never been biochemically perfect, transient hyperglycæmia having occurred frequently and often daily, and even ketosis on occasion. The present state of our knowledge may therefore be summed up by saying that there is no proof that either hyperglycæmia or hypercholesterolæmia are important factors in causing human arterio-sclerosis; and there is as yet no evidence that such hyperglycæmia and hypercholesterolæmia as may occur in the diabetic, treated satisfactorily according to the clinical standards mentioned above, predispose him to arterio-sclerotic complications.

A different aspect of the diabetic problem is raised in a short but important paper by T. FERGUSON. We know enough to-day to maintain most diabetics in a state of reasonable health and efficiency; but "is medical progress of the last fifteen years in this field being applied to yield its full results?" Is the general practitioner's knowledge and experience, supported by that of such hospital physicians as happen to have interested themselves in diabetes, adequate to give every diabetic in the country good treatment and good supervision? FERGUSON, speaking of Scotland, clearly doubts it. The continued management of diabetes is often neither simple nor easy; if it were we should not see so many papers and hear so many differences of opinion from the experts. Diabetic management should be shared between the general practitioner in close contact with his patient, and the diabetic clinic of a general hospital; the latter should be responsible for the patient's initial treatment and training, for help in time of difficulty, and for routine periodic supervision and overhaul as well as for the coöperation of dietitians and health visitors where needed. But diabetic clinics and physicians specially interested in diabetes are distributed in a haphazard fashion, dictated rather by the opportunities of consulting practice than by the needs of the diabetic population at large. The average diabetic patient cannot count on getting really good treatment; he just takes his chance. So with this disease, as to a greater extent with rheumatism, we have the knowledge to alleviate much ill health but we lack the means of applying it fully. We face again the problem of the place of medicine in the social structure, and we recognise again the need for a new form of organisation in which the first and over-ruling consideration is that good diagnosis and good treatment shall be available for every patient, and in which at the same time the individual doctor can play a willing, intelligent, and progressive rôle.

INCOME AND NEEDS

THE constituents of an adequate diet for the average individual, living and working under specified circumstances, are known with reasonable accuracy. It is possible from time to time to ascertain from official returns or by private inquiry its approximate cost and so to estimate the minimum amount of money which should be available for an average family consisting of so many members of certain ages and sexes, in order to maintain a sufficient level of nutrition. That has just been done again, and done very well, in a book entitled "The People's Food" (see p. 895). It is less easy to say how much—or how little—money ought to be at the disposal of an individual or a family to secure a standard of living which would make life really worth while. An attempt to arrive at a comprehensive figure which would represent the minimum subsistence requirement of a household of five persons (father, mother, and three dependent children) was made last year by Mr. SEEBOHM ROWNTREE. He concluded that not less than 53*s*. per week was the minimum average in towns and that similar families of agricultural workers might be maintained on 41*s*. For independent women workers his estimate was 30*s*. 9*d*. The quality of subsistence provided at these income levels has frequently been questioned, and Mr. ROWNTREE himself admitted its meagreness; so far as we are aware nobody has criticised it on the ground of luxuriousness.

Mr. KUCZYNSKI, in a book cited in this column recently, has taken these reckonings as the starting-point for an inquiry into the extent to which existing wages enable such families or independent women to maintain themselves. He notes that this country, which once led the world in successful studies of wage conditions, has neglected wage statistics recently, so that our data are now inferior in quantity and quality to those of the U.S.A. or Canada or Czechoslovakia or Germany. Most of the information he uses was obtained through a Government survey of earnings in October, 1935, and adjustments have accordingly had to be made for changes both in the rates of wages since then (so far as these are known) and in the cost of living before and after the time of Rowntree's computation. The wage statistics are presented for broad industrial groups, such as the textile industries, the metal, engineering, and

shipbuilding industries, the mining industries, the clothing industries. In each group the number of workers, male and female, whose *average* wages fall below the Rowntree standard is calculated. Some individuals in the low category, of course, actually earn more than this amount but, on the other hand, some of those excluded as falling into a class having higher average wages actually earn less. It is assumed, therefore, that the figures are near enough to the actual numbers living below this income level. The net result of the calculations indicates that 4 million male workers over 21 years of age are not earning sufficient to maintain a wife and three dependent children at a bare subsistence level, and that 2 million female workers over 18 years of age do not earn enough to maintain themselves independently. Assuming that 15 per cent. of the men have three or more dependent children, 3·6 million persons in these families are estimated actually to be living below the hunger level. The corresponding number in smaller families is put at 2 million and to these have to be added 1½ million in families with four or more children, where the income is above the Rowntree minimum but not sufficient to maintain the same standard of living because of the number of dependents. Adding to the 7 million thus obtained the 2 million women and some 500,000 men not earning enough for independent existence, Mr. KUCZYNSKI arrives at the conclusion that "about 10 million" workers and their dependents are underfed, underclothed, and underhoused at a time which is generally regarded as prosperous. He gives some data showing how wages have failed to keep pace with profits and the rising cost of living since the slump year, 1931.

The methods by which some of these calculations are made are not explained. One naturally assumes that an experienced statistician has exercised due care in arriving at his conclusions, and Mr. KUCZYNSKI states that these are really minimum figures. There is no means of knowing whether the proportions of young unmarried men, and of older men with few children entirely dependent on them, are the same among the 4 million earning less than the Rowntree minimum as for workers in general. The basis of the 15 per cent. estimated is not stated. In 1921, it may be noted, only 12·9 per cent. of all males had three or more dependent children. It is at least generally true that the largest families of young children are found amongst the lowest wage earners. More equivocal is the assumption that 2 million women earning less than the present-day equivalent of Rowntree's 30*s*. 9*d*. are entirely dependent on this income for their subsistence. The fact, for instance, that a large proportion of female textile workers are married women is not mentioned. The safest conclusions that may be drawn from this painstaking inquiry are (1) that many workers are receiving wages too low to maintain them in health and decency; and (2) that, if it is the aim of the community that most men over 21 years should marry and raise families of at least three children, some means must be found of removing the financial disabilities under which a very large proportion of them labour. One way in which this could be done was considered previously.

ANNOTATIONS

PHYSICAL BASIS OF ALCOHOLIC DISORDERS

Prof. Edward Mapother surveyed a wide field in his Norman Kerr lecture, delivered on Tuesday before the Society for the Study of Inebriety. In his opinion the psychological explanations for alcoholism, so far as they can be classified under "reduction of displeasure" (removal of general discomfort, reduction of inhibitions associated with causes of grief or remorse, reduction of anxiety), are mere sentimentality when applied to normal people. He prefers to postulate a state of discomfort of biochemical origin, occurring periodically, which the sufferer learns to allay by alcohol. It was not uncommon, he said, to find able and well-balanced men having crises of anxiety, which might account for the ruin some of them brought on their lives by occasional bouts of drunkenness. These attacks of anxiety might be due to excess of adrenaline, to whose action alcohol is antagonistic. As for the addiction to alcohol of those who eventually develop mental syndromes, it was usually part of the general self-indulgence of the psychopath. In general, however, one might say that addiction is commonly seen in those whose psychopathic tendency is of generalised and endogenous origin needing explanation in terms of biochemistry rather than psychology. There was little ground for belief in any quite specific craving for alcohol. There were individual differences in susceptibility and tolerance; but in spite of much chemical investigation, little was known about their physical or physiological basis.

Next the lecturer turned to those effects of prolonged alcoholism which persisted in its absence. These could not be viewed as persisting residues of the immediate changes produced by alcohol. It was more probable that alcohol acted as a preliminary poison rendering certain tissues vulnerable to specific toxic agents. At all events there was now good reason to consider that the mode of action of chronic alcoholism in causing organic changes was largely indirect. Here one had to consider the closely related disorders, beri-beri, pellagra, and subacute combined degeneration. It was possible to reconcile the somewhat differing distribution of lesions in these four conditions with the belief that the proximate causation of all might be the same. Although in all this the peripheral lesions had been most conspicuous, it was not remote from the problem of the alcoholic psychoses. The conditions with neuritis responded on the whole well to administration of vitamin B_1 or of liver extract, and it had lately been reported that vitamin B_1 gave dramatic results in the treatment of delirium tremens.

In stating some practical conclusions, Prof. Mapother said there could be no doubt of the importance of social changes in deciding the extent of alcoholism in a population. These changes were vastly more potent than anything yet achieved individually. It must be admitted that up to date the doctors had been much less effective than the

politicians in their attack upon addiction and the consequences of alcoholism. Of course, social measures for improvement need not be restrictive, but probably in this country a larger measure of restriction would improve things. Like many so-called moderate drinkers, he would gladly support total abolition of alcohol if he could have any belief that it would become universal. But that was impracticable here, because of our respect for individual liberty. In the treatment of addicts Prof. Mapother was more hopeful of results from physical than from any psychological methods yet invented. He knew of no published and verifiable facts indicating the efficiency of any special psychological forms of treatment. Although he had in the past pressed for legalisation of compulsory detention for alcoholism alone, he now thought this would be premature because of our present lack of effective remedy. While awaiting development of physical understanding and treatment, which seemed to be hopeful, we should advocate modesty, patience, and research.

SULPHANILAMIDE IN UNDULANT FEVER

THE results of treating undulant fever with any drug are difficult to assess and in individual cases practically impossible. Though it is true that the average duration of the diagnosed disease in this country is about three months, great variation is observed extending from a total duration of less than a week to one of a year or more. The most satisfactory way of obtaining a definite answer would be to give the specific treatment to alternate cases in a homogeneous series, and to compare the average duration of the disease in the treated and untreated groups. So far this has not been done. According to W. Dalrymple-Champneys[1] reports are available of 27 cases due to *Br. abortus* treated in England and Wales with Prontosil or sulphanilamide. In 14 of these the effect was judged to be beneficial and in 4 doubtful; in 9 no benefit was observed. Of greater importance are the observations of C. Z. Neumann[2] in Malta on cases infected with *Br. melitensis*. In 15 out of 16 patients, mostly children, treated by the oral administration of Prontosil rubrum, the average duration of the fever after the beginning of treatment was seven days. No controls were included, but it is stated that untreated cases usually take two to six months to become afebrile. The problem has been approached from the laboratory side by various workers. R. F. Montgomerie[3] in this country and B. D. Chinn[4] in the United States have both reported favourably on the effect of sulphanilamide treatment in guinea-pigs experimentally infected with *Br. abortus* or *Br. suis*. C. J. C. Britton[5] could demonstrate no deleterious effect of sulphanilamide on *Br. abortus* in vitro. Welch, Wentworth, and Mickle,[6] however, have found that in human beings suffering from undulant fever and in guinea-pigs infected with *Br. abortus* the phagocytic activity of the white blood-cells is increased by the administration of sulphanilamide. They believe that the drug acts not directly on the organisms themselves but by stimulating the opsonic power of the blood and so leading to a neutralisation of the endotoxins produced by the organisms. It is clear that our information is still very incomplete, but there is a justifiable hope that sulphanilamide, when we have learnt how to administer it, may prove of real value in the treatment of a highly refractory disease.

[1] *Brit. med. J.* 1938, **2**, 471.
[2] *Ibid*, p. 342.
[3] *Vet. Rec.* 1938, **50**, 380.
[4] *Proc. Soc. exp. Biol., N.Y.* 1938, **38**, 782.
[5] *Brit. J. exp. Path.* 1938, **19**, 146.
[6] *J. Amer. med. Ass.* 1938, **111**, 226.

SIR JAMES BAILLIE AND THE LEEDS MEDICAL SCHOOL

ON Sept. 23rd Sir James Baillie presided for the last time at a graduation ceremony in the Leeds Medical School. He has been vice-chancellor of the Leeds University since 1924, and it has been his custom, at graduations within the school of medicine, to deliver a short address to the new graduates. On the present occasion he recalled the ancient custom of binding those entering medicine to uphold the honour of the profession, to practise for the public weal, and to guard secrets entrusted to them. He thanked his medical colleagues for their loyal support, adding that no sphere of the University's activities had been to him of greater interest; "for," he said, "in certain significant respects I regard the medical faculty as the most important and the most difficult domain of pure and applied science in the whole range of the academic curriculum." Sir James, it may well be remembered, was speaking from a background which included 22 years in the chair of moral philosophy at Aberdeen and some widely known "Studies in Human Nature." Finally he remarked on the community of interest between members of the medical faculty, staff and students, and the rest of the University, and the growing bond of fellowship between all whose lives are dedicated to the attainment of truth and the possession of intellectual freedom. Mr. Harold Collinson, dean of the school of medicine, took the opportunity to express the regret of staff and students alike at Sir James's impending departure and to thank him for his unfailing encouragement and his support of improvements in medical teaching and facilities for research, which in some instances he had himself initiated.

CODEINE AS A DRUG OF ADDICTION

ATTENTION was called in these columns three years ago[1] to the remarkable increase of imports of codeine in Canada since 1927, and to the fact that it was to some extent replacing morphine among drug-addicts. In 1931 when the League of Nations was preparing for the conference on the limitation of manufacture of narcotics, which led up to the convention of that year, Dr. Paul Wolff, with three other experts appointed by the Council of the League, expressed the opinion that codeine was harmless and not a drug of addiction. This may or may not have been true of codeine administered per os, but it now appears that the drug is largely used by drug-addicts in the form of subcutaneous and intravenous injections, Dr. Wolff says in a timely contribution to the *Bulletin of the Health Organisation of the League of Nations* (1938, vol. 7) that he is now satisfied that this new vogue of parenteral administration of codeine undoubtedly represents a social danger which it is essential to overcome. Smuggling of the alkaloid into Canada has been disquieting and its illicit entry across the border into the United States has grown alarmingly. The estimates of consumption of codeine per million inhabitants were in 1935 in Canada 109 kg., in the United States 29 kg. It must be remembered that in the United States the existing legislation against narcotics is more stringent than in most other countries. Dr.

[1] *Lancet*, 1935, **1**, 1168.

Wolff urges the need not only for strict control of the manufacture, import, and export of codeine and of all wholesale trade in the drug, but also for the enforcement of the regulations so that the drug should really be unobtainable without a written prescription. He refers to experiments on animals with habit-forming drugs as more or less valueless. There is little or no analogy between monkeys and human beings in their reactions to codeine, while in dogs and rabbits the alkaloids of opium are apt to give rise to tetanic symptoms. When the first opium conference was held at The Hague in 1911–12 it was decided in article 14 of the Convention that the restrictions prescribed should apply "to all derivatives of morphine, of cocaine or their respective salts, and to every other alkaloid of opium, which may be shown by scientific research, generally recognised to be liable to similar abuse and production of like ill-effects." It is now clearly established that codeine, at any rate when employed parenterally, comes within this definition.

SOMATIC CHANGES DURING INDUCED HYPOGLYCÆMIA

THERE is now available an English translation [1] of Sakel's original series of articles in the *Wiener Medizinische Wochenschrift*, somewhat enlarged, and provided with an enthusiastic preface by Dr. Foster Kennedy. This is a convenience that should enable fresh writers on the clinical aspects of insulin treatment of schizophrenia to dispense with the preliminary account of the method, which takes up considerable space, and to content themselves with a reference to Sakel's exposition. The number of psychiatrists using this method is increasing. Most of these preliminary reports are cautiously favourable,[2] though there is an occasional report of misadventure—e.g., death from subarachnoid hæmorrhage during the treatment.[3] Besides these therapeutic studies there are now appearing accounts of more limited, but also more critical, investigations, chiefly into the somatic changes which occur during severe hypoglycæmia. One of the most interesting of these is the detailed review [4] by Ernst Gellhorn of the grounds on which insulin is inferred to benefit schizophrenic patients by bringing about a reduction in the oxidation-rate in the central nervous system and by the stimulation of the sympathetic centres which results from the diminution of metabolism. He supposes that such methods of treatment as continuous narcosis, Cardiazol injections, and the inhalation of 30–40 per cent. CO_2 have similar results because they produce, through a profound alteration in the metabolism of the central nervous system, a sufficiently strong and lasting excitation of the sympathetic nervous system. Although his previous researches have dealt so much with the effects of anoxia, and many writers have emphasised the relationship between anoxia and hypoglycæmia, Gellhorn is uncertain whether the alteration in metabolism is of specific importance here; he believes, however, that his interpretation provides a more rational line of procedure, in studying the therapy of schizophrenia, than do the theories put forward by Sakel and by J. H. Quastel. A different view as to the significance of anoxæmia in severe hypoglycæmia is held by Malamud and Grosh [5] who observe that the impaired oxidation of the brain which accompanies the hypoglycæmia does not explain the clinical manifestations nor the histopathological changes. These latter changes form the subject of their interesting communication, which describes the findings in the brain of a patient with islet-cell adenoma of the pancreas; the progressive destruction of the cerebral cortex and basal ganglia is provisionally interpreted by them (mainly, of course, on indirect evidence and by exclusion) as a direct toxic effect of insulin on the brain parenchyma.

In a chemical study of 5 schizophrenic patients whose condition improved after treatment with insulin, Randall and his colleagues [6] found a rise in the amount of wholeblood phospho-lipid, total cholesterol and total lipid, whereas in 9 out of 11 who did not improve during the treatment an early mild lipæmia was not maintained; the writers conclude, not quite convincingly, that the initial blood lipid level of a schizophrenic is below his optimum, although it is not outside the range of normal variation. They also speculate rather vaguely about a presumptive interference with the oxidative reactions of the brain in schizophrenia by metabolites, especially fats, which "clog" the cells. Still another study of the changes in hypoglycæmia is that of W. Beiglböck [7] who reviews the circulatory and hæmatological phenomena; he points to the fall in serum potassium and inorganic phosphates, along with the rise in sodium and, probably, in iodised calcium, as evidence of the antithesis between hypoglycæmia and anaphylactic shock, when looked at in the light of the "directed permeability" theory of Prof. Eppinger, in whose clinic he works. It is fairly clear, from these and other investigations, that a theoretical basis of insulin treatment of schizophrenia is yet to seek.

THE DEEP MINE

IN a debate on the work of the Mines Department held in the House of Commons last July Mr. Gordon Macdonald put forward a plea that the welfare of the workers in the deep hot pits should have immediate attention. He quoted the report of an inspection of the Parsonage pit, in which it was stated that the dry-bulb temperature in the mine was 102° F. and that the men worked naked. He also said that their loss of weight averaged 11 lb. per day. These statements were intended to be arresting and to excite compassion, but it must not be forgotten that similar (and indeed much higher) temperatures are encountered in all deep mines, in this or any other country, and that almost equally severe conditions fall to the lot of workmen in the steel industry, in stokeholds, and in hot deserts. The men referred to by Mr. Macdonald are therefore by no means alone in having to contend with very high working temperatures. Actually, their circumstances have been repeatedly investigated and medical research has nothing with which to reproach itself in this connexion. The great contribution was made by the late J. S. Haldane, who showed that the cause of the paroxysmal cramps to which the workers are liable is an excessive loss of salt in the sweat, and that the syndrome can be prevented by salting the drinking-water. This must have made an immense difference to the comfort of the men. Much of the recent work on the subject has been done in the United States during the con-

[1] The Pharmacological Shock Treatment of Schizophrenia. By Manfred Sakel. Authorised Translation by Joseph Wortis. New York: Nervous and Mental Disease Publishing Company. 1938. Pp. 136. $2.75.
[2] Reese, H. H., and Veer, A. V., *Arch. Neurol. Psychiat., Chicago*, 1938, **39**, 701.
[3] Freed, H., and Wofford, C. W., *Ibid*, p. 812.
[4] Gellhorn, E., *Ibid*, July, 1938, p. 125.
[5] Malamud, M., and Grosh, L. C., *Arch. intern. Med.* 1938, **61**, 579.
[6] Randall, L. O., Cameron, D. E., and Looney, J. M., *Amer. J. med. Sci.* 1938, **195**, 802.
[7] *Wien. klin. Wschr.* 1938, **51**, 497.

struction of the Great Boulder dam and in the Youngstown steel mills. It has been shown that the men become acclimatised to the working conditions and do not take any harm provided always they are physically suited to the work and well cared for in and out of working hours. Appalling though it may sound to some people to have to work naked at temperatures over 102° F. to earn one's daily bread, the fact remains that to be able to work naked is a substantial advantage to the men. There are many other industrial occupations which may appear much less exacting but are really much more dangerous.

RISE AND FALL OF THE ENDOTHELIOMA

IN 1869 Golgi suggested the term endothelioma for a firm meningeal tumour with a whorled appearance. Though the histogenesis of the meningioma is still disputed all agree now that it is not of endothelial origin, but Golgi's term became popular and was soon applied to any unusual tumour with a somewhat alveolar structure. It was not till about 25 years ago that many tumours formerly classified as endotheliomata began to be taken out of this category; most of those arising in lymph nodes or bones are now recognised as secondary deposits of carcinoma, or more rarely primary reticulosarcomata, and the endothelioma of the parotid is now regarded as an atypical adenoma. There remained in the group the primary tumours of vascular and lymphatic endothelium—in which the term is fully justified—and the primary tumours of peritoneum, pleura, and pericardium, which on histogenetic grounds merit inclusion. Even these remnants have been subjected to analytical criticism and Rupert Willis [1] in 1934 questioned whether all the published cases of primary tumours of serous membrane were not more likely to have been secondary deposits from an inconspicuous primary carcinoma. He now publishes [2] an instructive case in which he was led to revise a diagnosis.

The patient, aged 82 at death, had been admitted to hospital 8 years previously with a history of a hæmatemesis. No lesion of the gastro-intestinal tract was discovered but a large hilar shadow spreading to the left side of the chest was regarded as a possible neoplasm. He also had a hydrocœle already of 10 years' duration, which apparently troubled him little for another 7 years when it had grown larger and become painful. Numerous nodular masses were found growing from the walls of the excised hydrocœle sac and testis. The inguinal lymph nodes were not enlarged. Willis noted that the tumour had a carcinomatous appearance in some areas, but diagnosed it as probably an endothelioma arising from the serosal cells of the tunica vaginalis. Three months later he seemed in good health and radiograms of the chest showed no evidence of primary or secondary growth. However, a year after the operation he was readmitted with a firm mass of enlarged nodes in the groins. At autopsy growth was found in the inguinal and lumbar nodes, in the left lung, and in the wall of the upper lobe bronchus. There were also deposits in the bronchial and mediastinal nodes, in the liver, and in the peritoneum. The bronchial growth proved to be a papillary adenocarcinoma and there was no doubt that the tumours in the hydrocœle sac had been metastases therefrom.

Reviewing this case, Willis comes to the reasonable conclusion that the so-called hæmatemesis was really a hæmoptysis associated with the bronchial growth and that a partial pulmonary collapse produced the radiological appearances observed then and not later; further, that the deposit in the hydrocele sac was blood-borne, not lymphatic. He emphasises the need of a thorough post-mortem examination before a diagnosis of serosal endothelioma is accepted and the absence of distinctive histological criterion for this type of tumour.

In the same issue of the journal is an account by J. C. Dick [3] of an endothelioma of the pericardium. The patient, a man aged 21, had suffered from cough and breathlessness for 6 months and at one time coughed up some blood. Examination revealed mediastinal obstruction and a pericardial effusion. At autopsy the pericardial cavity was found to be filled with nodular masses of growth which extended from the base of the heart to the root of the right lung. Though the growth lay close to the right main bronchus, the mucous membrane showed no malignant change, but there was much growth in the adjacent lung tissue and lymph nodes. Dick noted that the tumour cells resembled proliferating pericardial cells, but the illustrations suggest an adenocarcinoma undergoing squamous metaplasia. If Willis's criterion is accepted an indisputable primary tumour of the serous membranes has yet to be described.

ANOTHER WARNING ABOUT THOROTRAST

THE use of Thorotrast for ventriculography and encephalography is condemned by Stuck and Reeves [4] after experiment at the Montreal Neurological Institute. Using cats, dogs, and monkeys they produced internal hydrocephalus within a few months by single and repeated cisternal and ventricular injections of small volumes of thorotrast. The degree of hydrocephalus was quite appreciable and it was demonstrated in all the animals except those that died shortly after the experiment. It was shown radiographically that, when injected into the ventricles, the thorotrast was rapidly cleared from the ventricular system and tended to collect in the subarachnoid spaces at the base of the brain. Here the particles were ingested by macrophages and later excited fibrosis. It is of both scientific and practical importance that no evidence could be obtained of any significant elimination of the thorotrast from the meninges or of its extension into the perineural spaces of the spinal nerves. It must be assumed therefore that the particles will rest indefinitely within macrophages in the subarachnoid spaces causing a mechanical obstruction to the flow of cerebro-spinal fluid.

Quite apart from any question of future trouble arising from the radio-active properties of thorotrast it stands condemned as a contrast medium both in ventriculography and encephalography. Its application to the central nervous system should probably be limited to arteriography; and even here, as was pointed out in the discussion at the Plymouth meeting of the British Medical Association, it is not without danger. Where, however, the patient's life is already jeopardised—as, for example, by a leaking cerebral aneurysm—arteriography alone may render surgical aid possible. Similar benefits have been derived from arteriography in localised arterial disease of the limbs, as described in this journal by Boyd.[5] The age of the patient again is a factor to be considered in view of the radio-active properties of thorotrast

[1] The Spread of Tumours in the Human Body. London. 1934, p. 77.
[2] *J. Path. Bact.* 1938, **47**, 35.
[3] *Ibid*, p. 43.
[4] Stuck, R. M., and Reeves, D. L., *Arch. Neurol. Psychiat., Chicago*, 1938, **40**, 86.
[5] Boyd, A. M., *Lancet*, 1937, **1**, 382; 1937, **2**, 1294.

and the fact that it is not eliminated from the body. In a follow-up study of 10 cases Yater and Whitmore [6] have obtained no evidence of ill effects attributable to thorotrast within 4–6 years after the injection of an average of 75 c.cm. Nor did they find any histological evidence of damage at necropsy in 64 cases examined after periods varying from a few days to three years after the intravenous injection of a similar volume of thorotrast. Nevertheless the possibility that trouble may arise after longer intervals than this should continue to have a restraining influence, especially where the patient is young.

DEL RIO-HORTEGA AT OXFORD

THE announcement, on another page of this issue, that two lectures on neurological histology are to be given at Oxford by Dr. P. del Rio-Hortega is welcome news. As many already know, Hortega took up his residence there during the early months of this year as reader in neuropathology under the Nuffield scheme. Forced by the relentless conduct of the civil war in Spain to leave his laboratory in Madrid, he found harbour for some time in Paris and now, fortunately for Oxford and for medical science in this country, he has accepted an appointment that will enable him both to continue his researches on brain tumours and to make his earlier work more fully known in this country. Those who have had the opportunity of examining his preparations will rejoice that this master of histological technique is now so placed that students of neurological pathology both in England and abroad will be able to visit him and to learn something of his art.

EMERGENCY MEASURES AT L.C.C. HOSPITALS

AN outline of the precautions taken in London against air raids during the recent emergency was given last Friday at a special meeting of the County Council (see p. 914). The hospitals and institutions under the public health and public assistance departments were classified into three grades. Grade A included hospitals fully equipped for all types of surgical work; Grade B those equipped for general surgical and acute medical work; and Grade C those suitable for chronic medical and convalescent patients. The number of beds on Oct. 1st was as follows:—

Grade A	
38 hospitals within the county	28,557
8 hospitals outside the county	5,023
Total	33,580
Grade B	
12 hospitals within the county	4,699
6 hospitals outside the county	3,354
3 institutions	2,174
Total	10,227
Grade C	
8 hospitals within the county	4,463
1 hospital outside the county	127
2 institutions	1,842
Total	6,432

Instruments and ward equipment, medical and surgical, were provided at ten fever hospitals, making a further 5000 beds available for acute surgical cases. All hospitals received a month's supply of drugs and dressings and the Grade A hospitals were also stocked with antitetanic serum and bleaching powder for dealing with mustard gas. Stores of food and fuel sufficient for three weeks were laid in, and the Council arranged for supplies of X ray tubes, valves, and films, curtains for darkening windows, candles and torches to meet a breakdown in the electrical supply, sand and shovels for dealing with incendiary bombs, and building material for repairing structural damage. The ambulance stations were stocked with splints, dressings, and stretchers, and one doctor and seven nurses from the L.C.C. staff were allotted to each of 21 ambulance trains. Arrangements were made for supplementing the hospital staffs at a few hours' notice by the transfer of those of the school medical and nursing staff not required for essential duties, and, with the coöperation of the central emergency committee of the British Medical Association, 70 surgeons with the necessary assistants were made available for staffing the ten upgraded fever hospitals. On Oct. 1st, after increasing the numbers in each hospital ward and making use of rooms ordinarily used for other purposes, over 16,000 empty beds would actually have been ready to receive casualties.

[6] Yater, W. M., and Whitmore, E. R., *Amer. J. med. Sci.* 1938, **195**, 198.

AN INVITATION TO ITALY

THE Carlo Forlanini Health Institute of Rome, which is a clinic for diseases of the respiratory system and tuberculosis, organises every year from January to April, courses on tuberculosis for foreign medical practitioners. The National Fascist Institute for Social Welfare offers to British medical practitioners a scholarship consisting of exemption from fees for registration and attendance at the course, free board and lodging at the institute, and other facilities. Three nominations are also offered entitling the holders to exemption from fees for registration and attendance at the training course. Candidates must be qualified medical practitioners of at least three years' standing who have rendered effective service in specialised medical clinics or sanatoria, or other scientific institutions for the treatment of tuberculosis. Any publications and attendance at other courses specialising in tuberculosis can be considered as claims for preference. With the concurrence of the Privy Council, the British Medical Association has undertaken to receive applications from medical practitioners, who should communicate with the secretary of the Association at B.M.A. House, Tavistock-square, London, W.C.1, not later than Nov. 1st, giving details of age, qualifications, and experience.

ON St. Luke's Day, Oct. 18th, at 4 P.M., Sir Edward Mellanby, F.R.S., will deliver the Harveian oration to the Royal College of Physicians. He will speak on the State and medical research. On Nov. 3rd Dr. Lionel Whitby will deliver the Bradshaw lecture on the chemotherapy of bacterial infection, on Nov. 8th and 10th Dr. Harold Scott the Fitzpatrick lectures on the conquest of disease in the tropics, and on Nov. 17th Prof. J. B. S. Haldane, F.R.S., a Lloyd Roberts lecture on some problems of human congenital disease. These lectures will be held at 5 P.M., and members of the medical profession will be admitted on presentation of their card.

THE Medical Research Council have appointed Sir Henry Bashford, F.R.C.P., chief medical officer of the General Post Office, and Sir Kenneth Lee, (chairman of the Tootal Broadhurst Lee Company) to fill vacancies in the membership of their Industrial Health Research Board.

THE London Medical Exhibition, the twenty-sixth of the series, will be held in the new hall of the Royal Horticultural Society, Westminster, from Monday to Friday of next week. It will be open daily from 11 A.M. to 6.30 P.M.

SPECIAL ARTICLES

RECENT RESEARCH IN ACUTE POLIOMYELITIS

BY J. R. PERDRAU, M.B. Lond.

(*From the National Institute for Medical Research, London*)

THE use of convalescent serum in infantile paralysis for prophylaxis or treatment would be a commonplace of modern medicine had its value been demonstrated as clearly as it has been in some other virus diseases (measles, dog distemper, &c.). It is the lack of such clear-cut evidence as well as disregard of some of the facts accumulated in recent years about viruses which renders the subject a controversial one.

VIRUS AND ANTIBODY, AND THE LIVING CELL

It has been shown that a virus which has gained access to a living cell is thereby protected against any agent capable of inactivating it. With viruses which can produce a local reaction (vaccinia, herpes), if the related antiserum reaches a particular site before the virus, there is no "take," but if the virus reaches it first a "take" results. A practical example of the principle involved is seen in the prophylaxis of measles by the injection of convalescent serum. Here it is clear that the antibody must reach the majority of the susceptible cells before the virus, and the most likely explanation of what happens is that the virus is neutralised either on the surface of the cell or in its immediate vicinity, because the injected antibodies may not be detectable in the circulating blood in a fully protected individual.

These observations apply to all viruses which give rise to a good specific immunity and which can infect tissues other than those of the central nervous system. Even neurotropic viruses which have a blood phase—e.g., louping-ill—can be neutralised in this manner before the central nervous system becomes infected. Between the bite of the tick and the onset of nervous symptoms there is ample time for the successful intervention of the specific antibody. With a neurotropic virus such as that of poliomyelitis, which gains access to the nervous tissues directly from the nasopharynx without passing through a blood phase, the presence of a good concentration of antibody in the circulating blood has no beneficial effect whatsoever.

BLOOD-BRAIN AND BLOOD-CORNEA BARRIERS

The reason for the failure of antiserum to protect in poliomyelitis can best be appreciated by a comparison with what happens in the cornea. A rabbit infected with herpes virus in *one* cornea will develop a keratitis, and after recovery a state of solid immunity exists in that cornea and in the central nervous system (as the result of extension of infection from the eye), but the other cornea remains susceptible to a local inoculation of virus. The reason would appear to be that the normal cornea is devoid of blood-vessels, and the only fluids which come into contact with its cells (anterior chamber fluid, tears) apparently contain only traces of the blood globulins with which the specific antibodies are associated. The recovered cornea is immune to reinoculation because it becomes vascularised as the result of the original keratitis, and as long as the animal is immune and these new blood-vessels persist, the cornea, rendered more permeable by the inflammatory process, remains resistant to reinfection. There appears, therefore, to be a blood-cornea barrier which is just as efficient as the blood-brain barrier.

A similar mechanism exists in the central nervous system except that blood-vessels are present everywhere in that organ. But in spite of their presence there, the only fluid actually in contact with the cellular tissue is the cerebro-spinal fluid, which does not normally contain the globulins of the blood, since the choroid plexus does not allow the passage of these proteins with their large molecules. The only way known so far for the central nervous system to become immune against neurotropic viruses is for the living virus to reach it; in other words, there is no immunity without infection. This is usually effected by the injection of the living virus into some tissue other than the nervous ones—e.g., skin, testis, and peritoneum. The method is dangerous and can only be used experimentally, since a proportion of the animals usually contract a fatal infection of the central nervous system.

Quite apart from the protected position of the virus inside the cells, this physiological barrier, the so-called blood-brain barrier, would suffice to prevent convalescent serum from affecting poliomyelitis beneficially in man and the monkey. The only large scale controlled experiment in man is that reported in America by Park (1932) in which the treated patients and controls were approximately equal in numbers. The final evaluation of the results (deaths, paralyses, &c.) showed no advantage whatsoever for those who received serum.[1] There is no record of a large scale controlled experiment in man for the testing of convalescent serum as a prophylactic in poliomyelitis, but the experimental data in the monkey are quite definite in demonstrating its uselessness.

On theoretical grounds partial benefit might sometimes be derived from the injection of serum in poliomyelitis. The lesions of poliomyelitis, say in the spinal cord, often show œdema and small hæmorrhages, and when these are present antibody in the blood stream would be able to reach the actual cells. It would have no effect on the cells already infected but it should protect normal cells in that localised area.

CHEMICAL PROPHYLAXIS

It is this failure of serum to protect which led some American investigators to try other non-specific methods of prophylaxis. Since all the evidence points to the nasopharynx as the natural portal of entry for the virus C. Armstrong, E. W. Schultz, and others[2] showed that if the nasal mucosa of a monkey was treated with protein-precipitants, such as alum, picric acid, or zinc sulphate, before a nasal inoculation of virus, the animal was often protected for three months or more, but susceptibility returned afterwards. A human experiment was tried in Toronto (Tisdall et al. 1937) in 1937 during an epidemic of poliomyelitis, when some 5000 children received a nasal spray of zinc sulphate and another 6000 children served as untreated controls. The result was a failure, since cases occurred in both groups, 11 in the treated one and 18 amongst the controls. Cases even occurred in a group of some 200 children who apparently had complete anosmia

[1] See *Lancet*, Sept. 17th, 1938, where Prof. S. P. Bedson dealt with this point in greater detail.

[2] See review by Schultz, *J. Pediat.* 1938, **13**, 38.

as the result of the spraying, so that efficient treatment of the olfactory area did not prevent infection. Greater experience of the method may perhaps yield better results.

The choice of zinc sulphate may have been unfortunate for the first large scale trial in man, and substances with a milder action on a mucous membrane but equally effective in the monkey may yet be found. Since specific immunity does not hold out any hope so far, there is every reason for trying other methods of temporarily barring the way to the entry of the neurotropic viruses in young people.

Most viruses are comparatively resistant to antiseptics which can be used as mouth-washes and so on. Carbolic acid in concentrations used for human purposes does not inactivate the virus. Oxidising agents, such as potassium permanganate, inactivate viruses fairly quickly, although the virus of poliomyelitis appears to be somewhat more resistant than others. Mechanical protection, such as a surgical mask, would appear to be preferable for contacts than the use of antiseptics.

EFFECT OF AGE

The statistics of the disease leave no doubt that so far the best protection against natural infection in poliomyelitis is age. Experimentally the little that has been done points in the same direction. Sabin and Olitsky (1938a) have shown that young mice are more susceptible than old ones to an intranasal inoculation of the neurotropic virus of equine encephalomyelitis. In some unpublished experiments by Dr. C. Todd and myself in 1937, for the purpose of testing the value of a vaccine of poliomyelitis virus inactivated by the photodynamic action of methylene-blue, we failed to infect nasally five rhesus monkeys which had been in the Institute for a year and were well grown, but eleven young ones, recent arrivals, vaccinated or not, succumbed to a single nasal inoculation. The outstanding point on which knowledge is now needed in the natural prophylaxis of neurotropic infections is probably the essential difference in the anatomy (and physiology) of the nervous and other connexions between the nasopharynx and the brain in the young and the adult.

PATH OF THE VIRUS

The path followed by the virus from the nose to the brain or from the brain to the cord in poliomyelitis and in other neurotropic infections has been studied experimentally, but, although the virus undoubtedly travels by way of the nerves, we do not yet know whether it is to be found in the axis-cylinder itself or alongside it. As regards size, the virus of poliomyelitis is small enough (10 mμ) to travel by way of the axis-cylinder, but could a larger virus such as that of herpes (125 mμ) do so, even if the electrical and other physical conditions were favourable? The only substances which have so far been shown to be able to spread along the axis-cylinder are dyes and certain salts in true solution. There is no evidence that even colloidal solutions can travel along the axis-cylinder with or without kataphoresis.

All the evidence accumulated so far points to the nasopharynx as the portal of entry, and the presence of the virus at this site in contacts and recovered cases has often been demonstrated. In recovered cases it has been found as long as four months later in man and five months later in the monkey (Lucas and Osgood 1911 and 1913). It is therefore impossible even to guess how long a possible carrier may be infective. The virus appears to multiply locally in the nasal mucosa before the onset of nervous symptoms (Sabin and Olitsky 1938b). Surgical intervention on the nasopharynx should not be resorted to in possible carriers, since the virus might be inoculated thereby directly into the tissues.

The virus has been demonstrated in the fæces of infected individuals (Trask and others 1938) probably as the result of the swallowing of infective mucus. There is no convincing evidence that the gut or even the skin, as has been suggested by some, can be a portal of entry.

On the whole recent research has tended to show our helplessness in the prophylaxis and treatment of poliomyelitis, but much can be done in the prevention of a spread of the infection by the protection of all possible contacts of actual cases. Nothing but good can come from the active research being carried out in numerous centres in America, even though the immediate practical benefits may not be obvious.

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OCCUPATIONAL MORTALITY

THE REGISTRAR-GENERAL'S DECENNIAL SUPPLEMENT, 1931

AT ten-yearly intervals the Registrar-General for England and Wales issues a document on vital statistics of very great interest and importance—namely, an analysis of mortality in relation to occupation and social class. For this purpose he utilises the appropriate populations recorded at the last census and the deaths registered in the three years around the census. The report issued this week[1] relates the deaths registered in 1930–32 to the populations recorded at the census of 1931 (multiplied by three, of course, to adjust the denominator to the numerator of the ratio deaths to population).

The report covers a wider field than any previous one. In the past the available statistics have been limited to the mortality experienced by males in different occupational and social groups. The Registrar-General has now extended his analysis to cover the mortality of the wives of these men. This is a momentous extension for it enables much light to be thrown upon the origin of an excess mortality amongst the males: whether, in fact, that excess is likely to be occupational in origin, in the strict sense of the word, or whether it is rather a concomitant of the occupation, derived from a social environment outside the occupation which is shared by the wives. If, for instance, the males employed in a particular occupation show a relatively high death-rate from tuberculosis and this disadvantage is not apparent amongst their wives, then an occupational origin of that high rate may well be suspected. If, on the other hand, wives as well as husbands labour under an unduly high rate it seems more likely that some other factor is at fault, such as their common social environment or standard of living.

[1] The Registrar-General's Decennial Supplement. England and Wales. 1931. Part II (a) Occupational Mortality. H.M. Stationery Office. 1938. Pp. 404. 17s. 6d.

In addition the Registrar-General has introduced for the first time some mortality-rates experienced by single women engaged in different occupations; comparisons of death-rates according to social class in different parts of the country; a study of the mortality of children aged 1–2 years according to the occupation and social class of the parents—in addition to the analysis of infant mortality repeated from earlier reports; and the occupational incidence of some 20 causes of death not previously analysed in this respect. With so rich a supply of new information we can do no more than quote a few of the more striking outcomes of researches that have required seven laborious years and bear fine witness to the enthusiasm and statistical acumen of the compilers of the report.

STANDARDISED MORTALITY RATIOS

Before passing to results we must note the technique employed in comparing the mortality experiences of different occupational and social groups. Since such groups may, and do, differ widely in their age distribution crude death-rates are not a reliable measure of the environmental risks. Differences between such rates may be merely a reflection of the differences in the age distributions of the populations at risk. Some form of standardisation is imperative. In the report itself various forms have been applied and, broadly speaking, it is found that each method gives closely similar results. The form most often adopted is the standardised mortality ratio.

This figure is the ratio of the deaths actually occurring in an occupational group in the years 1930–32 to the deaths that would have occurred if that group had experienced the death-rates at ages which were the lot of all males in England and Wales in the same calendar years. For instance, at ages 20–65 years, 5693 deaths of male farmers and their relatives were registered in 1930–32. But if the population of this group, as recorded at the census of 1931, had experienced the death-rates of all males in 1930–32, then it would have recorded 7801 deaths. In other words, allowing for the particular age distribution of male farmers and their relatives, the actual mortality of the group was only 73 per cent. of its "expected" mortality, using the experience of all males as the standard of comparison. The standardised mortality ratio is, therefore, 73. These ratios have been calculated for two age-groups, 20–65 and 35–65, and in the same way for many specific causes of death.

On this basis some of the results may be examined.

TOTAL MORTALITY BY SOCIAL CLASS

One of the most striking features of the report of 1921–23 was the steep gradient of mortality as one passed down the social classes.

In those years the standardised mortality ratio of males (excluding non-civilians) of Social Class I—the professional and generally well-to-do section of the population—was 82, or in other words, as just described, their actual mortality was, when age was allowed for, 18 per cent. below the mortality of all males. The corresponding ratio of Social Class V—labourers or other unskilled callings—was 121, or 21 per cent. above the mortality of all males. The ratio for the latter was, thus, 48 per cent. higher than the ratio for the former.

A remarkable feature of the 1930–32 figures is the great diminution of the regrettable contrast between the mortality ratios of the well-to-do and the labouring classes.

In these years the mortality ratios for civilian males are 87 for Class I and 112 for Class V, the latter being 28 per cent. in excess of the former in place of the 48 per cent. recorded ten years earlier. (If non-civilians are included the excess is only 23 per cent., the difference being due in the main to the high relative mortality of commissioned officers, particularly of the Air Force.)

Detailed comparison shows that between 1921–23 and 1930–32 mortality in Class V fell by 18 per cent., in Classes IV and III by 6 and 7 per cent., in Class II by 10 per cent., and in Class I remained unchanged. The greatest improvement is at ages 25 to 45.

Married women's mortality according to the social class of the husband follows the same trend as that of the males but exhibits a wider range of variation.

The mortality ratios at ages 20–65 range from 81 for Class I to 113 for Class V, a difference of 40 per cent. This sex difference appears to be due to the fact, referred to again below, that "the wives do not share to any considerable extent in the compensating disadvantages of affluence which men suffer, through an enhanced mortality from an important group of diseases." It may also be noted that married women's mortalities compare very favourably with those of males at every age period and are at ages 25–65 somewhat below those of single women.

In general it appears from these sex comparisons, and from the regional study of the data, that the immediate effects of occupation on men's mortality are of relatively slight importance compared with the environmental and economic conditions of home life. The worse these general environmental conditions the greater become the social contrasts in mortality for both sexes. An additional and important observation is that the effects of such factors are very much less serious in rural areas than in industrial towns.

DISEASES OF POVERTY AND AFFLUENCE

All causes of death do not, of course, contribute to the social gradient of mortality outlined above. Indeed many of them run in opposite directions, and a division can be made of "diseases of poverty" and "diseases of affluence."

The former, comprising causes of death which show an increase in poor social circumstances both for males and their wives, include tuberculosis, syphilitic diseases, cancer (all sites), valvular heart disease, myocardial disease, arterio-sclerosis, bronchitis, pneumonia, pleurisy, hernia, insanity (not G.P.I.), gastric ulcer, and accidental causes. On the other hand, leukæmia, acute endocarditis, angina pectoris, appendicitis, cirrhosis of liver, and suicide, all show, both for males and their wives, an increase in good social circumstances. Diseases of the prostate show the same trend. A third group, consisting of diabetes, cerebral vascular lesions, nephritis, and gall-stones with other gall-bladder diseases, also shows a significant excess for men in the more favoured social classes, but the first three are affected in the reverse manner by social class amongst married women, whilst gall-stones is unaffected. Although, the Registrar-General concludes, some of these have been generally regarded also as diseases of affluence on the basis of their male mortality gradients with social class, the fact that there is amongst married women a different association with social class makes it necessary to qualify that view.

A final observation on these deaths by cause is that though the social gradient of the poverty diseases is much the same for men and married women (at ages 35–65), the gradient of the diseases of affluence is far more pronounced for males than for females. It is this sex difference, combined with the effect of the diseases running in opposite directions for the two sexes, which produces the greater social range of mortality in married women previously referred

to. In each social class at ages 35–65 married women's total mortality is much below that of men, but whereas the excess for men is 40 per cent. in Classes IV and V, it is 51 per cent. in Class II and 55 per cent. in Class I. The greater survival advantage of women over men in the better circumstanced classes seems to arise because married women "do not suffer the same penalties of a 'comfortable' income (whether these have their origin in over nutrition or a more sedentary life) as do men."

SOCIAL CLASS AND CANCER

Evidence of a rising mortality from cancer of the "exposed" sites with falling social class was a feature of the 1921–23 report. How far that trend was a function of occupational risks, how far of general environment, is a question of considerable interest and importance. The present report analyses the figures in great detail for 40 different sites or groups of sites. From cancer for all sites it is found that the mortality gradient with social class is much less pronounced for married women than for males. On the other hand, for cancer of the upper alimentary canal (all portions above the pylorus), married women present a class gradient very similar to that of males. The standardised mortality ratios at ages 35–65 range in males from 63 in Class I to 129 in Class V and in married women from 56 to 119. For the stomach alone they run from 55 to 122 for males and from 49 to 121 for married women. It must necessarily be concluded that the factors responsible for these social class differences are more closely connected with the general economic circumstances, home life or dietaries of the people, than with the occupations they follow. Another observation of importance with this group of sites is that the mortality contrast between Classes I and V is significantly less in 1930–32 than in 1921–23, suggesting a decrease in the intensity of the responsible irritant factors, assisted perhaps by more effective treatment of cancer of the more accessible sites in the lowest classes. Cancer of the larynx shows an unmistakable class gradient amongst males, but not amongst married women, suggesting for this site a direct association with occupation. For cancer of the skin, however, married women also show an increase with lower social status, showing that purely occupational factors are here not the only ones at issue.

An important fact revealed for the first time is a regular gradation of mortality from cancer of the uterus, the mortality ratio of Class V being as much as double that of Class I. Breast cancer amongst married women on the other hand declines from a figure of 138 in Class I to 82 in Class V. The probable connexion of these trends with class differences in fertility is discussed at length. Amongst other sites cancer of the intestine and rectum, the lung, the liver, and the pancreas, show no social gradient, though mortality from cancer of the lung is extremely low amongst agricultural labourers and their wives.

OCCUPATION AND MORTALITY

A great deal of the Report is naturally taken up with the tabulation and discussion of the mortality-rates experienced by specific occupations, and interest is enhanced in this respect by the introduction of causes of death not previously tabulated—e.g., erysipelas, pernicious anæmia, rheumatic fever, asthma, and diseases of the ear and mastoid.

From all causes of death the four occupational groups with the most unfavourable experience (out of 198 groups) are tin and copper mine workers below ground, sand-blasters, other metalliferous mine workers below ground, and stevedores with standardised mortality ratios of 342, 304, 283, and 220. The first three of these groups share an extremely high death-rate from respiratory tuberculosis, and from diseases of the respiratory system including chronic interstitial pneumonia. The four occupations with the most favourable experience are agricultural machine workers and foremen, wireless operators and telegraphists (not sea-going), makers of non-metalliferous mine and quarry products, and draughtsmen and costing clerks, with mortality ratios of 55, 63, 64, and 65. It will be observed that the worst death ratios are 5–6 times as high as the best.

Other items of interest, picked nearly at random from the wealth of information, are as follows:—

Skilled workers in gas works' service show 23 deaths from cancer of the larynx and lung at ages 45 upwards compared with only 7 "expected" deaths, an excess of interest in view of the suspected agency of tar substances in the production of cancer of the respiratory organs. An excess of cancer of the lung which is probably significant is also revealed by metal grinders. Cotton strippers and grinders exposed to the dust of the cardroom continue to show an excess from diseases of the respiratory system, though it is rather less pronounced than in 1921–23. Phthisis remains an unduly important cause of death throughout the working life of skilled boot and shoe factory operatives and continues to cause a relatively high mortality amongst printers. The consistent excess of cancer mortality in all the groups of male and female makers of paper and paper goods, which is not apparent amongst the wives of skilled paper workers, suggests some occupational causation. Tram drivers and omnibus and tram conductors show a slightly enhanced mortality from peptic ulcer which was not present in 1921–23.

Physicians and surgeons show a total mortality not very different from that of all males, but division by cause of death gives significant excesses under angina pectoris, the group of "other diseases of the digestive system," and appendicitis. For digestive diseases as a whole their ratio was exceeded by only one occupational group—innkeepers, but on the other hand their rates from cancer and phthisis were very favourable. Their wives have a normal rate for digestive diseases.

Authors, editors, and journalists have a normal general mortality and no significant excesses from any cause.

MORTALITY IN THE FIRST TWO YEARS OF LIFE

The final section of the report comprises studies of the mortality of legitimate infants and of children aged 1–2 in relation to the social class and occupation of the father, and of illegitimate infants and young children in relation to the same characteristics for the mother. Between 1921–23 and 1930–32 the legitimate infant mortality-rate of the country fell by 22 per cent.—from 79 per 1000 live births to 62. Social differences regrettably remain very much the same.

The range in 1921–23 was from 97 per 1000 in Class V to 38 in Class I, a ratio of 2·5 to 1. In 1930–32 the corresponding figures were 77 and 33, a ratio of 2·3 to 1. In other words at both periods Class I had a rate about half the national figure while for Class V the rate was about 25 per cent. in excess of the national figure. Division by age shows that at 0–4 weeks Class V mortality is 1¼ times that in Class I, while at 6–9 months it is 5·4 times as high; the latter ratio continues to prevail at 9–12 months, and it is still over 5 in the second year of life. In the first year of life tuberculosis mortality increased from 3 per 10,000 legitimate livebirths in Class I

to 13 in Class V, whooping-cough from 3 to 27, measles from 0 to 22, bronchitis and pneumonia from 28 to 188, and diarrhœa and enteritis from 20 to 79.

Similarly at age 1–2 almost every cause of death was affected to a considerable degree by social class. Class V children suffered a measles mortality 19 times as great, and a whooping-cough, bronchitis, and pneumonia mortality 7 times as great as Class I children. As a contrast it is interesting to observe the extremely low infant death-rate of officers of the defence forces—24·5 per 1000 for the whole year and 15 per 1000 for the first four weeks, demonstrating, it is suggested, the level to which total and neonatal mortality can be reduced under supervision.

GRAINS AND SCRUPLES

Under this heading appear week by week the unfettered thoughts of doctors in various occupations. Each contributor is responsible for the section for a month; his name can be seen later in the half-yearly index

BY A VOICE IN THE WILDERNESS

III

IN medicine we have approached the study of health through the study of disease. I propose to examine international relations in the same way and to discuss to-day the biology of war.

Thucydides, in his account of the wars between Athens and Sparta, makes the island of Melos, ruthlessly attacked by the Athenians, speak as Abyssinia and every articulate small State has spoken since: "If we surrender now we give up *all* hope; if we fight there is at least a chance we may survive. We have justice, God and our ally Sparta on our side." Athens replies, "Justice in this world is only possible between two powers of equal strength. God helps those who help themselves. As for Sparta, she well recognises the principle that national honour and national interest invariably coincide." Honour, like conscience, is not absolute, and no State takes up arms unless it is convinced that it has honour on its side. I do not believe there is any right or wrong in war. The phenomenon is as devoid of ethics as typhoid, but equally unpleasant. I have now to demonstrate that it is equally a subject for unemotional scientific investigation. My aim will be to present the problem rather than offer the solution. This can only come from further investigation. To emphasise that war may be studied as a social disease, I shall approach it as an unwritten chapter from "Osler."

* * *

Definition.—Clausewitz regarded war as a peculiar technique of policy involving the use of military force for a political, economic, doctrinaire, or religious purpose. This definition is faulty, inasmuch as military force may be used for a purpose without the production of war, for example the international policing of the Saar territory and the use of force as a threat. War involves conflict between organised groups of human beings. It is the use of mass violence to get results.

* * *

History.—In the past the study of war has been mainly the affair of militarists and historians, concerned rather with the evolution of tactics and the correlation of events, than with the underlying causes of these events and general principles. Schemes for the abolition of war have repeatedly been advanced from the tenth century onwards. The first of these was the Church's attempt to outlaw war in Europe by means of the "Peace of God" and the "Truce of God." The former proclaimed that in areas around churches and monasteries private war could never be waged on Sunday, and this was later extended so that, by the twelfth century, it was illegal to wage war between Wednesday evening and the following Monday evening. But these regulations were never properly enforced. The Abbé of Saint-Pierre, Bentham, Kant, and Ladd all outlined schemes for world federations. However, it is only in the last thirty years that scientists have begun seriously to study war and peace. One may mention G. F. Nicolai, a cardiologist and professor of physiology at Berlin, whose book the "Biology of War" earned for him imprisonment in Germany during the late war. Much literature now comes from America, and there is a "Causes of War" research section of the University of Chicago under Prof. Quincy Wright.

* * *

Varieties of war.—No doubt in the future wars will be classified on an ætiological basis. Until this is possible, a purely descriptive classification avoiding speculations as to causation is best. Five main varieties may be recognised:—

1. Civil wars (such as the English, American, and Spanish). In these, the side backed by the majority of the population tends ultimately to win, but the cost, both in lives and economic losses, is far in excess of comparable contemporary international wars. Many rebellions and even revolutions, the French revolution, for example, never reach a stage of recognised war.
2. Colonial wars. In these, the colonising power may fight the natives (the Abyssinian war), its own or other settlers (the war of American independence and the Boer war), or another colonising power (the Anglo-French wars in India and Canada).
3. Wars of national liberation, where a national minority fights the ruling State, such as the Dutch revolt against Spain, and, in the great war, the revolts of Poland, Czechoslovakia, and the Arabs.
4. War between a great and a small power—the Prussian-Danish war over Schleswig-Holstein, for example.
5. War between two or more great powers.

If one allows ethical considerations, there is much to justify a war of type 3. Types 2 and 4 are usually quickly over and need not give rise to world wars. Wars of the last type are of special interest in that they tend to involve other powers; in only three of the fourteen war periods of the last three centuries, which involved one or more great power on each side and lasted more than two years, did a single great power avoid being drawn into war.

Aggressive wars do not figure as a variety. All wars are aggressive, though to decide who is initially the real aggressor is often impossible. Fear of encirclement may lead to a "preventive" war, and on this basis it is claimed that Germany was not the aggressor in the great war.

* * *

Incidence.—This has been studied in detail by Prof. Wright. His conclusions are as follows: The usual duration of war, unless one side is fairly easily defeated, is four to five years. Very rarely

wars are longer, but in these long wars continuous series of campaigns have seldom lasted more than four to five years. With a fairly equal balance between the two sides, as in the American civil war and the great war, four to five years appears to be about as much as a modern State can stand.

Since the sixteenth century a definite fluctuation between war and peace has been observed. There appears to be a tendency for warfare to become concentrated at fifty-year intervals, with each alternate concentration more severe. In the seventeenth century this concentration is least marked, but as time goes on the concentration becomes greater and the intervals of peace more complete. The following Table illustrates the European war cycle.

Thirty Years War	1618–1648
Wars of Louis XIV	1667–1684
War of the Spanish Succession	1701–1714
Seven Years War	1756–1763
Napoleonic Wars	1793–1815
Crimean War and Wars of Italian and German Nationalism	1854–1878
World War	1914–1918

The cause of this fluctuation is disputed. It may be that the passage of two generations gives "time to forget." It may be economic. The repair of the destruction and dislocation of a major war, and the development of new techniques in offence and defence may take fifty years. A long fifty-year economic cycle has been described. Lastly, in England and the United States particular political parties tend to dominate for fifty-year periods. On the basis of this cycle, can we prognose that in thirty years' time there will be a moderately severe war period, and in eighty years' time an intense war period? In the past twenty years there have been no political changes which do not find a mirror in history. Critical times have by no means led always to war. So, as a scientific speculation on past experience, we may hope at the most for thirty moderately peaceful years ahead in which to investigate the biology of war and to apply our results.

That war is cyclical does not, however, mean that it is inevitable. Russia and Germany appear to have abolished one great social cycle, the trade cycle, so there is no reason to suppose that the war cycle may not also be broken.

* * *

Ætiology.—We have no certain knowledge of the causes of war, but an immense number of hypotheses have been put forward. Exciting causes, for example the Sarajevo incident, seem much less important than the predisposing causes. Where the latter exist, sooner or later the former will arise. The suggested predisposing and underlying causes fall into three main groups: economic, political, and psychological.

1. *Economic.*—War probably began as an economic process, a struggle for pasturage, possessions, and later trade. In the past, military force could and did compel trade, for example with the American Indians. But as science increases national self-sufficiency, economics become less important as a cause of war. It is difficult to make a man a willing customer by fighting him, as the French found in the Ruhr. If a government does not intend permanently to occupy a territory, it gains nothing by forcing a trade agreement on it, for experience shows that such agreements are not kept. Most economists consider military force an inadequate economic instrument. Nevertheless, economics are sometimes used as a smoke screen put up to justify a war. Geology may be said to have caused the Boer war. Had there been no gold in the Transvaal, there would have been little to fight about. But now war between two fairly equal powers as a booty-snatching contest simply is not a paying proposition.

There are three possible conditions in which economics might in the future cause war.

The first is economic penetration. The developed country comes to resent the developer and may default on interest or seize capital goods. Formerly the big guns were at the call of big business, but arbitration is now found as a rule cheaper and more satisfactory in the long run—e.g., the Anglo-Iranian oil dispute. Only harsh treatment of the developer's alien minority might provoke the mother country to war. But this would be a war of prestige rather than economic gain.

The second is economic inequality. Formerly agricultural inequality was the most important and the British penetration of India has been attributed to agricultural needs. Now jealousy centres on the rarer minerals which are deposited quite haphazard in the surface of the earth. The British Empire has a virtual monopoly of china clay, gold, mica, monazite, nickel, and strontium. Other important semi-monopolies are asbestos (90 per cent. British Empire), chromite (63 per cent. Canada), potash (94 per cent. Germany and France), antimony (78 per cent. China and Bolivia), petroleum (70 per cent. U.S.A.), and copper (50 per cent. U.S.A.). Of these, nickel and petroleum are of dangerous importance in time of war. But it is probably fear of being left without in war time rather than the actual lack which might cause a war.

The third is differential population. In Europe, where the industrial countries are already in sight of their maxima, this is hardly likely to be a factor. But while the Dominions remain grossly underpopulated and Japan has emigration difficulties, this cause may become operative.

Lastly, as an economic factor, though only doubtfully as a direct cause, the activities of private armaments firms must not be forgotten.

2. *Political.*—In every war a multitude of political factors comes into play. But four of these outstand.

The first is lack of an external arbiter between States. Sovereign States demand, in the last resort, to be allowed to judge their own case. This means that the State must be capable of defeating any possible litigant, if the dispute comes to blows. If this principle be applied to all sovereign States, its absurdity becomes manifest. The combination of litigant with arbiter is recognised as absurd in law. But the mere presence of an honest and disinterested arbiter is not enough. There must be reasonable assurance that his decision will take into account not only international law but also economic, political, social, and psychological "justice." Lastly, it must be obvious to both litigants that his decisions will be enforced.

The second is the balance of power. This is not a method of preserving peace. It is a method of preventing the dominion of one sovereign State over the others by alliances and war. If State A appears to be getting too powerful, States B and C combine, defensively only, to prevent aggression by A. Unless A can itself make alliances, it feels it is being "encircled," and starts a "preventive" war—e.g., the great war. Mutual assistance pacts appear more likely to guarantee victory in war rather than the preservation of peace.

The third is the existence of national minorities. If these belong to small or completely partitioned States, they are unlikely to start a war, but once one has started between two major powers, they may seize their opportunity. But a national minority of a large power, especially if in the hands of a small power, is a potential cause of war.

Lastly we must consider war as a national cement. History abounds in prudent rulers who have realised that troubles at home are forgotten in war abroad.

In many of the Pacific islands, inhabited by only a few hundred individuals, these are divided into two tribes habitually at war with each other. Each needs an enemy in order to preserve its internal solidarity. It has been wisely said that world union can only be produced in face of aggression from Mars.

3. *Psychological.*—Inasmuch as it is human minds which finally make war, its ultimate causes may be found by the psychologist. I believe that there is at present no absolute scientific certainty as to whether war is ever a reasonable procedure. So one can scarcely speak of wars as rational or irrational; probably all are mixtures. The economic and political pros and cons may be weighed up, but the emotions upset the balance. Rome offered Carthage peace or war, and the Carthaginians with one voice chose the latter. It was the voice of the irrational herd. On an instinctive and emotional level, war satisfies the desires for (*a*) Membership of a group or herd. (*b*) Aggression, pugnacity, hate, sadism and revenge; the non-combatant can satisfy his sadism by proxy. (*c*) Excitement and relief of boredom. (*d*) An object to make life worth living; this is demonstrated by the fall in suicide rate during war. (*e*) Power for the leaders and thousands of little leaders which militaristic activity produces. (*f*) Pride and vanity.

In peace time to be powerful, to be proud, and to hate is, or ought to be, anti-social. War allows these with a good conscience. Freud suggests that this emotional satisfaction is bought at the price of a collective psychosis, for the individuals concerned lose insight and reason until the delusion is dissipated. But pre-existing jealousy (justified or unjustified), covetousness, selfishness, and fear may be even more important in the initiation of war than the possibility of the satisfaction of the emotions through war. Wars fought for religion and doctrines must perhaps be considered as psychological. For in both cases few will fight unless they are blindly and irrationally convinced that their opinion is right.

Is there a single key, at present missing or unrecognised, to the whole ætiology of war, or is it a thing of many factors? Until this question is answered a complete rational prophylaxis is impossible. And I suggest that the question can only be answered by organised scientific research.

OPENING OF THE MEDICAL SCHOOLS

THE formal inauguration of the session at University College Hospital was postponed until Oct. 11th. We print below extracts from the opening address delivered to students on that day.

LISTER AT UNIVERSITY COLLEGE AND HOSPITAL

BY SIR STCLAIR THOMSON, M.D., F.R.C.P., F.R.C.S.
HOUSE SURGEON TO LISTER IN 1883

IT was said by Disraeli that "one of the greatest legacies of any nation is the memory of a great man and the inheritance of a great example." Such an inheritance adds to the treasure store of any school of medicine and particularly to the younger ones, such as yours and mine. We both can rejoice in cherishing the memory and example of the greatest of all the masters of surgery, for Lister received his early training in University College, he felt the first impulse towards his great life-work in University College Hospital, and this reached its full fruition during the sixteen years that he worked in the wards of King's College Hospital to demonstrate the truth of his principles.

Lister's steps were directed towards University College because his father, a prosperous wine merchant of wide culture, held that an arts course was an essential preparation for a medical career. The family were Quakers and therefore in the middle of last century excluded from the older universities by religious tests. University College had been founded not long before 1844, when Lister entered, as a non-sectarian institution. He did not much enjoy his course for the B.A., not possessing the gifts or tastes for shining in any of the subjects, and though he took his degree he gained no distinctions until at the age of 20 he began his medical career under such eminent teachers as Lindley (botany), Carpenter (medical jurisprudence), Graham (chemistry) and Ellis (anatomy), Wharton Jones (ophthalmology and general philosophy), and William Sharpey (physiology). The latter especially had a momentous influence in shaping Lister's career. Lister's academic record at the hospital was brilliant. These were the days when the medals and scholarships of the London University examinations were pursued with the enthusiasm and deadly earnestness which appear nowadays to be diverted to cup-ties. It is interesting to note the mutations in the records of the different metropolitan schools. A letter received by Lister in 1850 thanks him "for having sustained the honours of the school: had it not been for you University College would have been a nonentity in the honours list, where it now stands the second school in London, placing Guy's first and St. George's third." It might also be noted that such large schools as St. Bartholomew's, St. Thomas's, and the London were not "placed" that year. In those days most of the Cambridge and Oxford men went to St. George's. In my own student days University College nearly always captured most of the distinctions in the medical department. Lister was an active member of the debating society and an energetic supporter of the hospital medical society, whose records include pages of minutes written by him.

It was not necessary, in those days, to be qualified before holding a resident appointment, and Lister had already served as house physician to Dr. Walshe and house surgeon to Sir John Erichsen when he became M.B. (and F.R.C.S.) in 1852. It must have been a pleasant and salutary change from his too-Quakerish boyhood to the varied and pleasant club-life of a hospital resident. I know no happier period in our professional career: deeply interesting work, with the attractions of its scientific side and the emotion of the human contacts, and the camaraderie with others united in the same quest.

On entering the house Lister came into close contact with young men of other denominations, and also with teachers who had the broad views of people who move in the great world. Amongst such was Sir Henry Thompson, who was house surgeon when Lister was a dresser. His special professional interest was in urology; but he was also an artist of considerable merit, he wrote novels, drove a showy carriage, and founded the Cremation Society. In his youth (but not in old age) he was a fervent total abstainer, but choice wines and food were placed

before his guests at the famous men's dinners ("Thompson's octaves") he gave at 35, Wimpole-street. Later Thompson was joined in practice by another alumnus of U.C.H., also well known for culture, artistic tastes, hospitality, medical benefactions, and physical vigour—Sir Buckston Browne.

Altogether Lister had spent 9 years at University College and Hospital—during which he was present at the first operation ever performed in this country under a general anæsthetic—before he left to seek further experience elsewhere. Sharpey advised him, before visiting continental schools, to go to Edinburgh to work under Prof. James Syme, and this advice, duly followed, affected his whole life because he became successively Syme's house surgeon, assistant, and son-in-law, and finally succeeded him as professor of surgery in the university.

Thus ended Lister's intimate connexion with University College, and I can trace only three events which associated him with it later. He applied in vain for the post of professor vacated by the resignation of Mr. Quain; he was subsequently elected a fellow of the college and in 1882 he came from Edinburgh to deliver an address to your medical society on the application of a knowledge of hydrostatics and hydraulics to practical medicine.

Lister did more for the progress of surgery than all the surgeons of the world since the days of Hippocrates had together been able to effect. It is customary to divide the history of our world into the two periods before and after Christ—B.C. and A.D. The history of medicine and of bodily suffering will always be divided into the times before and after the coming of Lister. Those of you who were not alive in the times of this astounding evolution may feel some difficulty in realising with what horrors surgery was accompanied before his day. Suppuration occurred in most operation wounds; every surgical ward in the world reeked with the stench of putrefaction and the "hospital smell" was looked on as inevitable in surgical wards. The chances were that one out of every three or four patients operated on would die. Erichsen, analysing in 1874 the results of all the amputations in University College Hospital, recorded a general case-mortality rate of 25 per cent. which he considered "a very satisfactory result." In lying-in hospitals the rate might reach 25–30 per cent. (Last year, in this country, it was more like 30 per 10,000.) The scope of surgery was so limited that one operation theatre and one day a week were sufficient for the operations of your entire staff, and the operations consisted chiefly of amputations of limbs crushed by accidents, or of those with compound fractures, for which amputation was the safest treatment. Erichsen prophesied in 1874 that "the abdomen, the chest, and the brain would be for ever shut from the intrusion of the wise and humane surgeon," and another surgeon said that "an abdominal operation should be classed amongst the methods of the executioner."

University College Hospital was perhaps the first in London to learn of Lister's evangel and to practise his methods, through Marcus Beck, his cousin, who worked to carry out antiseptic methods thoroughly and efficiently in face of almost unbelievable opposition. Later University College Hospital supplied another apostle to the Gentiles, Sir Rickman Godlee, who met with more success.

When I was Lister's house surgeon, our instruments and our hands were what we called "purified" by being scrubbed with soap and water and soaked in a 5 per cent. carbolic lotion. The field of operation was protected by towels soaked in the same lotion. We operated in a cloud of carbolic lotion spray. There was no sterilisation by heat of either instruments or dressings. The latter consisted of gauze saturated with such antiseptics as carbolic or double cyanide of mercury. We wore no gowns or gloves. But our results were excellent and it is as well to remember that, even without the modern impressive ritual, such results can be obtained by anyone who has grasped the principles of Listerism and acts upon them, even if operating in old and crowded hospitals, in the cottages of the poor, on the field of battle, or in the cabin of a crowded ship. The work of Lister, like that of Pasteur, is firmly founded on principles which can never alter.

During the siege of Paris (1870–71) Nélaton, in despair at the sight of the death of almost every patient after operation, declared that he who could conquer prevalent infection would deserve a statue made of gold. Lister wrought more for the relief of bodily suffering, for the security of human life, for the prevention of anxiety, for the conversion of fear into joy, for the promotion of happiness, and for the enrichment of the life of mankind, than any one man who has ever trod this earth. It was in University College and Hospital that he was trained for his mission, strengthened in his scientific outlook, and inspired by the great teachers of a great School. Let us rejoice in the legacy left to all here in the remembrance of such an example.

INFECTIOUS DISEASE

IN ENGLAND AND WALES DURING THE WEEK ENDED OCT. 1ST, 1938

Notifications.—The following cases of infectious disease were notified during the week: Small-pox, 0; scarlet fever, 1776; diphtheria, 1209; enteric fever, 41 (67 "expected"); pneumonia (primary or influenzal), 448; puerperal pyrexia, 169; cerebro-spinal fever, 18; acute poliomyelitis, 56; encephalitis lethargica, 2; dysentery, 27; ophthalmia neonatorum, 78. No case of cholera, plague, or typhus fever was notified during the week.

Poliomyelitis continues to wane, the total poliomyelitis and polio-encephalitis cases combined being 56, 63, 83, 76, 82, 76, 83, 87, 63, 41, 29 for this and the previous ten weeks (working backwards).

The number of cases in the Infectious Hospitals of the London County Council on Oct. 7th was 2363, which included: Scarlet fever, 625; diphtheria, 937 (carriers, 31); measles, 18; whooping-cough, 190; puerperal fever, 13 mothers (plus 9 babies); encephalitis lethargica, 273; poliomyelitis, 14. At St. Margaret's Hospital there were 16 babies (plus 6 mothers) with ophthalmia neonatorum.

Deaths.—In 126 great towns, including London, there was no death from small-pox, 1 (0) from enteric fever, 3 (0) from measles, 1 (0) from scarlet fever, 10 (1) from whooping-cough, 30 (3) from diphtheria, 40 (9) from diarrhœa and enteritis under two years, and 16 (0) from influenza. The figures in parentheses are those for London itself.

Fatal cases of diphtheria were scattered over 22 great towns, 3 each at Liverpool and Leicester, 2 each at South Shields and Birmingham. Birmingham had 4 deaths from diarrhœa, Hull and Middlesbrough each 3.

The number of stillbirths notified during the week was 275 (corresponding to a rate of 40 per 1000 total births), including 36 in London.

PREPARATORY SCHOOL SCHOLARSHIPS.—Next March two scholarships of £100 each, founded by Sir Milsom Rees and tenable at Port Regis Preparatory School, will be awarded to the sons of medical men. Candidates must be under 9 years of age at the time of competing, and the scholarships are normally tenable till the holder leaves the school. The holders will be selected at an interview in London from among those boys who have done best in some simple examination conducted in or near their homes. Applications should be addressed to the head master, Port Regis School, Broadstairs, from whom full particulars may be obtained.

PUBLIC HEALTH

DYSENTERY IN A MENTAL HOSPITAL

BY DONALD BUCKLE, M.B. Melb., D.P.M.

(*From Tooting Bec Hospital, London*)

MILD bacillary dysentery broke out at Tooting Bec Hospital at the beginning of this year. Though the average age of our patients is 73 years, the clinical features were the same as in other epidemics of this type. Systematic fæcal cultures were taken from the outset and organisms of the Sonne-dispar group were isolated from a large proportion of the 115 patients.

The disease was characteristically a mild diarrhœa, with five or six loose motions during 24–48 hours, followed by several days' constipation. The abnormal motions were watery; they usually contained copious mucus, but rarely any blood. The general symptoms were usually slight, but in a few debilitated patients signs of collapse appeared, with coldness and vasoconstriction. Although generally considered a mild disease, it is not uncommon for Sonne dysentery to be much more severe than this outbreak would indicate, and I have seen normally healthy adults with obvious toxæmia, abdominal pains, headache, and stools almost entirely of mucus for several days. These patients have often had a few mild attacks in the previous months and have been in contact with other sufferers. Severe symptoms have also been described by Laws (1936) and by Thornton and Darmady (1938). Some of our patients developed an acute bronchiolitis after the dysentery and 2 died from this cause. No deaths could be attributed directly to the infection. A mild pyrexia (99°–101° F.) was usual for the first two days.

ONSET, SPREAD, AND TREATMENT

The outbreak commenced with 6 cases on the first day, 7 on the second, 1 on the third, 6 on the fourth, and so on. When it was well under way in one wing of the hospital with 27 cases in eight days, the infection spread to a distant wing where again 13 cases were ill in the first two days. Both epidemics were in wings of the hospital containing female patients only; the nurses are separate although they live and mess together. There were only 11 proved cases among male patients, but the outbreak in their wing began later when the control of the contagion was better understood, and isolation was more effective, so that these cases were really sporadic. Cultures were made of the fæces of nurses in contact with the two wards where the outbreak first appeared, and of the food porters and kitchen workers. In 6 of these the organism was isolated, and the individuals dealt with, but no follow-ups were done on 5, so that one cannot say if they were contact carriers or persistent carriers. At this time it was known that there were many cases of Sonne infection in the general population of London, and from the Table it will be seen that no case harbouring the bacillus was found among the well patients; also, in the year preceding, 45 fæcal specimens had been examined with negative results. The source of the epidemic, then, may have come from outside the hospital.

The patients received only symptomatic medication for complications such as bronchitis and circulatory failure. All cases with diarrhœa were promptly isolated and full infectious precautions were adopted. The fall in incidence of the disease coincided roughly with the development of efficiency in preventive measures, but this cannot be demonstrated statistically.

ILL PATIENTS

Patients with positive fæcal cultures	74
" " repeated negative cultures	41
Of these: Serum agglutinated	11
Serum negative	10
Not known to be contacts	11
Abnormal intestinal flora	3
Unaccountable negatives	16

Examinations (555)

Fæcal cultures—			
Sonne	118	*B. fæcalis alk.*	2
Morgan	2	Negative	412
"Paracolon"	21		

HEALTHY CONTACTS

Patients (67). Examinations (120)

Fæcal cultures—			
Sonne	0	*B. fæcalis alk.*	1
Morgan	1	Negative	113
"Paracolon"	5		

STAFF CONTACTS

Individuals (25). Examinations (31)

Fæcal cultures—			
Sonne	6	Negative	22
"Paracolon"	3		

BACTERIOLOGY

The organism isolated in routine investigations was the *Bacillus dysenteriæ* Sonne, but further tests showed that some strains possessed atypical features. The investigation of these organisms, which is still proceeding, will be the subject of a later paper.

Fæcal cultures were made, usually from the first loose stool of a patient, and were repeated till at least three negative cultures were returned. The specimens were collected in dry cartons at first, and later in bottles of 30 per cent. glycerin in saline, and were stroked as soon as possible on MacConkey plates. At first three plates were used for each specimen, as advised by Havens (1935), but after the first week owing to crowding of incubator space only one plate was used, with apparently no smaller proportion of positive results. All pale colonies were subcultured for 8 hours in broth and then sugars were inoculated. Suspicious organisms were then agglutinated against dysentery sera. If an organism was typical in its sugar reactions but agglutinated Sonne serum only feebly it was subcultured and agglutinated once more. In *no* case did a culture which gave the typical Sonne reactions in lactose, glucose, mannitol, and sucrose fail to agglutinate or partially agglutinate Sonne serum (Oxford, rough titre 250). The titres of the 53 positives were: 18 with 1 in 25; 16, 1 in 50; 8, 1 in 125; 11, 1 in 250. Other cultures—i.e., follow-up specimens on patients and a few at the height of the epidemic, which gave the typical sugar reactions—were regarded as positive. Atypical sugar reactions were repeated always, and none of these ever changed to Sonne type fermentations. From these findings it is considered that the sugar reactions in lactose, glucose, mannitol, and sucrose are specific for the purposes of the practical epidemiologic control.

Nearly 600 fæcal cultures were examined in this way and 124 were positive. Most of these strains were repeatedly examined for sugar reactions and found to be true to type. Many other organisms

than Sonne and *Bacillus coli communis* were found —atypical *B. coli* of all kinds, Morgan's bacillus, *Bacillus fæcalis alkaligenes*, and paracolon types. These bacteria were in evidence only during the epidemic and were not found before or after that period.

Of 115 patients whose illness corresponded clinically to a Sonne dysentery, 74 (or 64 per cent.) gave positive fæcal cultures. Of the 41 negative cases, 21 had their sera examined several times during the first months, and 11 of these gave positive agglutinations with a stock Sonne strain in titres of over 1 in 25. If this result in a patient can be accepted as indicating that he has had a Sonne infection recently the number of positive diagnoses by the combination of methods in the 115 patients is 85.* It is possible that if the sera of all these patients with negative fæcal cultures had been examined the number of positive diagnoses would be higher. Of the 30 patients with diarrhœa which was not diagnosed bacteriologically, it is likely that some never had the disease at all. From this group 110 fæcal cultures were made, 108 showing *B. coli* only, 1 Morgan's bacillus, and 2 paracolon bacilli. Dietetic diarrhœas are common in old people and this may account for some. Eleven of these were never in a ward where there were any proved dysentery cases. Apart from the latter group, and the 3 with abnormal flora, there appears to be no selection operating among the negatives. It is therefore probable that 16 patients had Sonne dysentery which could not be diagnosed bacteriologically.

The organisms usually disappeared from the stools in two or three days, but in 3 cases they persisted for a month.

COMMENTS

The interest of this outbreak lies chiefly in its large size and its occurring where active and prompt bacteriological investigation could be done. The high proportion of positive fæcal cultures is probably due to the fact that all the work was done in the hospital and very little time was lost between the collection of specimens and their incubation on media. Other epidemics where time may have been unavoidably lost at this point—e.g., Laws (1936)—do not show so many positive results, but in the outbreak described by Bloch (1938) there was a high proportion of positives for the above reasons.

Suddenness of onset and high infectivity were features of the outbreak, and there was such immediate widespread sowing among patients and staff that the tracing of the cause after the epidemic was under way appeared a hopeless task. In this connexion such work as that of Bloch (1938) is of great interest in trying to estimate the position of the carrier state in relation to epidemics, because proved persistent carriers of this organism are apparently rare, and, compared with the other organisms of the typhoid-salmonella-dysentery group, little investigation has been done to elucidate this point. When fæcal cultures are performed as a routine in institutions the source of such infections can be traced and isolated before epidemics occur. Thornton and Darmady (1938) and Fraser and Smith (1930) emphasise the fact that endemic cases develop throughout wide areas and the desirability of investigating all sporadic cases of diarrhœa.

* I am aware of the fact that some authorities (Havens 1935) state that the so-called normal agglutinins for Sonne's bacillus are found in human sera as high as 1 in 40, but Ritchie (quoted by Felsen and Osofsky 1934) studied 792 normal sera and found that none agglutinated this organism. In the public health and mental hospital departments of the L.C.C. the titre of the Oxford laboratory, of greater than 1 in 10, is considered significant.

SUMMARY

In an outbreak of dysentery involving 115 patients it was found that though the cases all appeared to be Sonne infections clinically only 85 per cent. could be proved so bacteriologically.

My thanks are due to Dr. P. M. Turnbull, superintendent of Tooting Bec Hospital, for permission to publish these results, and to Mr. N. Holmes for his valuable assistance in the laboratory.

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Air-raid Precautions in London

AT a special meeting of the L.C.C. on Oct. 7th the air-raid precautions subcommittee reported on the special measures taken on behalf of the Council in the last few weeks. The Council has authorised the addition of 420 units to the permanent strength of the London Fire Brigade, and 30,000 volunteers (of whom 10,000 were forthcoming by the end of September) will be required to man the auxiliary service. Suitable commercial vehicles have been earmarked for towing the trailer pumps, and arrangements have been made for the augmentation of the normal water-supplies and for keeping all potential supplies—swimming-baths, ponds, and the like—full of water. The organisation of hospital and ambulance transport and air-raid casualties has now been taken over by the Ministry of Health. The Ministry has purchased 10,000 beds with necessary bedding, has upgraded nearly all the Council's fever hospitals to the status of full surgical hospitals by the purchase of additional equipment, and has provided emergency stocks of drugs, dressings, sera, and fuel at all affected hospitals. For the augmentation of the ambulance service some 2000 vehicles are required to be adapted as emergency ambulances and 5000 women drivers are needed. The Ministry has already secured the vehicles, and the need for drivers is being advertised by folders sent out with licences and through the A.A. and R.A.C. Equipment is already made for adapting as ambulances the 69 vehicles used for taking children to special schools and a number of the London Passenger Transport Board's motor-coaches. In June the Council's officer presented a memorandum to the Parliamentary committee on evacuation of civilians showing how the child population could best be dealt with. On Sept. 22nd the Home Office requested the Council to prepare a scheme immediately on the suggested lines and transmit it to the schools next day. Working day and night the education officer's department succeeded in the task and by the 29th 80 per cent. of parents had agreed to entrust their children to the organisation, nearly 3000 school departments had been notified of the station to which they must proceed, a rota had been fixed for their arrival, bus transport had been arranged for infants, guides had been allotted, and 20,000 teachers and 500,000 children were ready to move on the receipt of a code telegram. Billeting arrangements at the other end were entrusted to the authorities in those areas. Over 3000 physically or mentally defective children and 1200 toddlers from nursery schools were actually

evacuated on the 28th and 29th and these have now been safely returned to London.

Water from the South Downs

The Sussex south coast towns from Eastbourne to Chichester are fortunate in being able to draw their water-supplies from the great watershed of the South Downs, and even in long periods of drought the supplies have hitherto always met the demands upon them. But in the last twenty years extensive residential colonies have developed around the large boroughs like Brighton, Hove, and Worthing, and these have necessitated continuous additions to the supply. The question arises as to how long the South Downs, extensive as they are, will continue to meet the ever-increasing calls of the houses which even now are springing up like seedlings. The Duke of Norfolk, by no means a pessimist, in opening the Littlehampton urban council's new waterworks on the downs at Burpham, not far from Arundel Castle, said it was possible, no matter what experts might say, that there would ultimately be a shortage of water on the south coast. On one of his farms difficulty had already been experienced in getting water and his Grace jokingly complained that Worthing was swallowing up the supply. In Littlehampton alone, which is by no means one of the largest towns in the area, the daily maximum demand for water has increased in ten years from 400,000 to 600,000 gallons. Figures for the great towns are not available, but they would certainly show corresponding increases. That new sources had to be tapped is evidence that the yield of the old ones, if it is not decreasing, is insufficient to satisfy the new calls, and the local authorities concerned should, at any rate, take all possible steps to guard against waste.

PARLIAMENTARY INTELLIGENCE

NOTES ON CURRENT TOPICS

Air-raid Precautions

IN the House of Commons on Oct. 5th Mr. R. C. MORRISON asked the Home Secretary whether he was aware of the uncertainty of local authorities, business firms, and the general public, as to future action with regard to air-raid precautions, and whether he had any statement to make?—Sir S. HOARE, in reply, said: I recognise the importance of informing local authorities and all concerned about the future development of air-raid precautions. It is clear that these precautions, essential for the safety of the civil population, must be carried out thoroughly and must be extended. I am glad to say that the recruiting of personnel is being pressed on by local authorities, for a sound scheme of precautions depends on having the necessary men and women for all the services trained and instructed beforehand. My Department is collecting from local authorities material on the lessons of the past weeks, and no time will be lost in considering it and reaching conclusions. While emphasising the need for extension and improvement of our plans, I am sure that the House would wish me to place on record my appreciation of the work carried out by the local authorities and their staffs, by the air-raid precaution personnel, and by all the men and women who came forward to assist in the last few weeks.—Mr. MORRISON: Will the right hon. gentleman bear in mind that a multitude of people volunteered their services last week, and that it will be essential to have some early decision given to the local authorities as to their future action, before the people collected last week are all dispersed so that it is impossible to get them together again?—Sir S. HOARE: Yes, Sir, I fully appreciate the urgency of the question which the hon. gentleman has just asked me. I am now pressing the local authorities to give me the data on which one can base conclusions. As soon as I have got the data I will reach conclusions and take as early an opportunity as I can of announcing them to the House.

QUESTION TIME

WEDNESDAY, OCT. 5TH

A Standard of Water Hardness

Mr. LIDDALL asked the Minister of Health what was the maximum hardness laid down by his department as desirable in a domestic water-supply; and what towns, having an average water hardness greater than this, had installed water-softening plants for treating the town's supply.—Mr. BERNAYS, Parliamentary Secretary to the Ministry of Health, replied: I am advised that arrangements for the treatment of water must be determined on the facts of each particular case. My department has not considered it necessary, therefore, to recommend water undertakers to adopt a maximum standard of hardness.

Tuberculosis in Newfoundland

Mr. GALLACHER asked the Secretary of State for Dominion Affairs what statistics were available of the incidence of tuberculosis and similar diseases in Newfoundland now and at the time of the appointment of the governing commission.—Mr. MACDONALD replied: Figures of the death-rate from tuberculosis in Newfoundland over a period of years from 1925 were given in reply to a question on April 13th last year. A recent survey which has been carried out suggests that the incidence of tuberculosis in the island is about 6600 cases per 100,000 of the population. The problem is one which is engaging the serious attention of the Newfoundland Government and steps have been taken recently to enlarge the tuberculosis sanatorium and to inaugurate special measures to control and prevent the spread of this disease.

Mr. GALLACHER: While it is desirable to have the sanatorium increased in order to deal with the disease, would it not be much better to make a real effort to restore the economy and the democratic institutions, and to allow these people to get a real opportunity of freeing themselves from the disease?—Mr. LUNN: Is not the general health of the community of Newfoundland seriously affected by the poverty of the people?—Mr. MACDONALD: Yes, Sir, and part of the policy of the Provisional Government has been to improve nutrition in the island so that health would also improve.

THURSDAY, OCT. 6TH

Hospital Arrangements in Staffordshire

Mr. MANDER asked the Minister of Health the present position with regard to the arrangements for hospital treatment for persons resident in Wednesfield and Willenhall organised by the Staffordshire County Council, both public assistance and hospital contributors; whether he was aware that great inconvenience and dissatisfaction still existed owing to the continued use of Wordsley; what medical staff there was at this institution; and whether any arrangements had been made for payment of the travelling expenses of relatives paying visits to Wordsley.—Mr. BERNAYS replied: I am informed by the county council that they are proceeding with the reorganisation of their hospital arrangements in accordance with the plans already known to the hon. Member, and that the present situation is not, to their knowledge, giving rise to any difficulties. An assistant medical officer resides at Wordsley Hospital, the medical officer lives in the immediate vicinity, and the services of specialists are available if necessary. I understand that it is the county council's practice in necessitous cases to pay the travelling expenses of relatives visiting the hospital.

CORRESPONDENCE

ASPHYXIA NEONATORUM

To the Editor of THE LANCET

SIR,—My neglected impulse to make comment on your leading article of Sept. 24th, on Babies Who Do Not Breathe, has been revived by a little word—"then"—in Dr. Douglas Belfrage's account, in your last issue, of the baby who so nearly succumbed to "drowning" from liquor amnii. The babe "made one or two feeble efforts to breathe": the mucus catheter was used—it filled with liquor amnii—and "the child was *then* (my italics) held up by the feet" and "liquor ran steadily from the nose and mouth."

The point I have in mind is the desirability (I always act on it as a prime necessity) of immediately holding up each new-born baby—and particularly those born by Cæsarean section—by the feet, the head being fully extended, to straighten out the trachea, by grapsing the forehead in one's other hand, until the flow of cervical mucus and/or liquor amnii has ceased. Thereafter may be used, in the cases needing it, the mucus catheter, or even intubation aided by the laryngoscope as advocated by Flagg and others.

On first reading your leading article I feared that the simple and rapid drainage by gravitation described above might be discarded out of respect for "the latest treatment"—the modern and more elaborate intubation—and that this being not available nothing would be done. (Just as, to my own knowledge, the reputation of blood transfusion has at times led to the neglect of simple saline infusions.)

The other point you mention is the need for correct posture—laying down the baby "with its head lower than the rest of the body." All clinics should, I think, use Blaikley and Gibberd's "inclined receiving table," but lacking this, in domiciliary practice, the drained baby can be laid, with pillowed buttock, in an inclined cot, to remain, after an injection of lobeline, under the watchful eye of the doctor or nurse.

It is known and yet too often forgotten that "babies who do not breathe" may be over-treated—by energetic and ill-timed artificial respiration. The air-passages having been cleared, warmth and leaving alone are often all that is needed. Most obstetricians of large experience must have known of babies forlornly laid aside as dead unexpectedly coming to life. Perhaps the best instance of this is described by William Smellie:—

CASE 203. (McClintock.) *A Child recovered after being put aside as dead.*—In the year 1757 I was called by a midwife to a woman in labour in the seventh month, who, before I arrived, had flooded a good deal, though the hæmorrhagy was stopped. The patient was soon delivered of a child, to all appearance dead; and, after the midwife had tried the common methods of rubbing the temples and breast with brandy, whipping and holding onion to the mouth and nose, it was laid by in a closet. About five minutes were consumed in these experiments, and in two or three minutes more, while I was prescribing some medicines to recruit the weak patient, I heard a kind of whimpering noise in the closet. Not knowing where the child was laid, I asked if there was a kitten confined in that place. The nurse immediately ran into the closet, and brought out the child, which was alive, and afterwards reared, though with great difficulty.

In another case (204) the child also seemed to be dead but Smellie "inflated the lungs by blowing into the mouth through a female catheter" "until the child began to breathe; and it actually recovered."

I am, Sir, yours faithfully,

Sheffield, Oct. 9th. MILES H. PHILLIPS.

To the Editor of THE LANCET

SIR,—Dr. Belfrage has done a real service in emphasising the value of endotracheal intubation in the resuscitation of the new-born.

I wish to draw attention to a point in connexion with the size of the tube that is of importance. Dr. Belfrage wrote that a Magill's No. 1 tube was used and that it fitted fairly tightly. As a result of experience gained in intubating infants of about six weeks for hare-lip operations, I have found that the tube size 00 is the most satisfactory. I have only once used the size 1 in an infant of six weeks and as Dr. Belfrage remarks it fitted fairly tightly. Twelve hours after the operation the infant developed signs of respiratory obstruction which persisted for thirty-six hours. I think that this was due to an œdema of the glottis caused by too large a tube. It would be a pity if this valuable method of resuscitation should fall into disrepute owing to complications arising from the use of tubes that are too large.

I am, Sir, yours faithfully,

Hove, Sussex, Oct. 8th. REX BINNING.

ROYAL MEDICAL BENEVOLENT FUND: AN APPEAL

To the Editor of THE LANCET

SIR,—Each year for nearly thirty years Christmas gifts have been sent, in the spirit of good cheer, through the agency of the Royal Medical Benevolent Fund to members of medical families whose poverty and distress, often coupled with infirmity, illness, and loneliness, have made their ageing days a pitiful existence. Those who have received the gifts are old medical practitioners or their widows and daughters who are debarred from any luxury or lighter pleasures in life. What luxury or extra pleasure can be enjoyed on an income of £90 a year which has to meet all the necessities of life?

The committee has felt that this is a matter which always appeals to the warm and generous hearts of medical men and women, and that no broadcast appeal should ever be made to the general public. "The family" to whom our gifts are sent is a very large one and we need over £1000 if each one of our beneficiaries is to receive the customary Christmas gift of thirty shillings. This can be done only if we receive the same generous response as last year. I know that the present days are difficult but everyone could spare a small contribution to add to the pleasure of those whose lives are sad at Christmas time.

Please send donations, large or small, to the hon. treasurer at the address given below. I thank all for their help and coöperation in past years in our Christmas gift scheme and shall be deeply grateful for a generous response to this appeal.

I am, Sir, yours faithfully,

THOS. BARLOW,
President.

11, Chandos-street, Cavendish-square, London, W.1, Oct. 5th.

*** A member of the committee of the fund has prepared a leaflet entitled "A Plea for the Unremembered." Copies for distribution may be had from the secretary of the fund.—ED. L.

VENEREAL DISEASES

To the Editor of THE LANCET

SIR,—Dr. Seddon Taylor's reply of Sept. 10th suggests that he has not fully understood my argument. In the first instance I did not intend to imply that the method of treatment I advocated was applicable only to seafarers. The results of treatment by this method are in fact so good that it is the sole method adopted in all the clinics in Liverpool. The Seamen's Dispensary caters chiefly for seafarers owing to its easy accessibility to the docks and the various sailors' homes, but even there 30 per cent. of our patients are not connected with the sea. Two other clinics—the Central Clinic, at Mill Road Hospital, and the clinic at the Royal Infirmary—are civilian clinics with only a small proportion of seafarers. Nevertheless the only treatment used is the intensive course with rest periods as previously mentioned.

I am well aware of Earle Moore's figures mentioned by Dr. Taylor, but these cannot be taken as a convincing proof that the consecutive method of treatment is superior to the concurrent method. Rather do they demonstrate the fact that regularly spaced treatment is far in advance of irregularly spaced treatment, a point which I made abundantly clear in the paper published in the *British Journal of Venereal Diseases*. In that paper I showed that whereas in regularly treated cases, up to and including secondary syphilis, the successes were 100 per cent., in irregularly treated cases with the same amount of treatment the results were only 71 per cent. and 56 per cent. successful in primary and secondary cases respectively. Moore has not compared his continuous treatment with the type of treatment commonly given in this country, but rather with a type of treatment that is execrated by all competent syphilologists. Does Dr. Taylor consider a clinical relapse-rate of 2·7 per cent. in well treated primary and secondary cases a low figure? Because this is the relapse-rate of his method of treatment as quoted by the American Co-operative Group. The relapse-rate varies from 13·13 per cent. in cases treated with little arsenic and little heavy metal to 2·7 per cent. treated adequately with much arsenic and much heavy metal. As against this, if Dr. Taylor will refer to my paper in the *B.J.V.D.* he will find that the Wassermann relapse-rate—which is admitted to be greater than the clinical relapse-rate—is in the series of cases treated by intensive methods *nil*. In a recent survey of all primary and secondary cases treated by concurrent methods in Liverpool since 1917, numbering some 5000 cases, the clinical relapse-rate is less than 1 per cent. (54 out of 5435 cases). The comparative figure for the American Co-operative Group is slightly in excess of 8 per cent. (204 out of 2544 cases). Throughout Moore's excellent book there are frequent references to the danger of muco-cutaneous relapse and the incidence of neuro-recidives, and one has the definite feeling that patients treated by the continuous method advocated are on the brink of relapse and neuro-recidives appear to be relatively common (pp. 26 and 27). This is certainly not our experience.

Finally I would like to say a few words about the problem of the defaulter. I cannot agree that the rest period is the chief cause of the defaulting patient. In quite a large number of cases during the rest period a bottle of infusion of gentian was given in order to preserve continuity in those patients able to attend regularly. The result was a miserable failure since the default-rate remained as before. I merely mentioned the possibility of compulsion and notification as a method which might help to prevent defaulting. It could not stigmatise those patients having the desire to be cured and might prevent the irresponsible ones from infecting others. Naturally such legislation could only follow intensive propaganda and the education of the public whereby problems associated with venereal diseases could be discussed as freely as those associated with tuberculosis are at present.

I am, Sir, yours faithfully,

Liverpool, Oct. 7th. ERNEST E. PREBBLE.

TUBERCULIN PATCH TESTS IN CHILDREN

To the Editor of THE LANCET

SIR,—Dr. Hart's discussion of the tuberculin patch test in your issue of Sept. 10th suggested that a negative patch test be followed by an intracutaneous test using 1/100 O.T. As the patch test is equivalent to a Mantoux with a dilution of 1/10,000 O.T., an intradermal test using 1/1000 seems more reasonable.

My experience with the Vollmer (Lederle) test in large scale testing of children justifies the use of the test as a reliable method in children below five or six years of age. In this group a negative patch test may be accepted, without a retest, as a reliable indication of the absence of any significant tuberculous lesion. To avoid painful vesiculation I remove the plaster after twenty-four hours rather than forty-eight hours afterward and read the reaction in another forty-eight hours.

As to the Mantoux test giving too many positive reactions repeated testing may cause an increase in an already existing sensitiveness to tuberculoprotein (too slight to respond to a single test). This factor must be considered as a possible cause of the great number of positive reactions. I have found the use of purified protein derivative tuberculin reduces to a minimum the number of pseudo reactions.

I am, Sir, yours faithfully,

A. J. LOGIE, L.R.C.P. & S.E.

Florida State Board of Health (Division of Tuberculosis), Sept. 27th.

OSTEOGENIC SARCOMA OF TIBIA

To the Editor of THE LANCET

SIR,—In Mr. MacLeod's article in THE LANCET of Oct. 8th (p. 824) the bulk of the evidence taken from the literature confirms his claim that cure of a true osteogenic sarcoma is of extreme rarity. So rare that one's suspicions are aroused as to the infallibility of the diagnosis in this case. The histological evidence produced in support was obtained from the material removed at three biopsies, but the interpretation of the histological appearances in every case is different. The material from the first biopsy is reported as an "osteosarcoma"; the second, a "spindle-celled sarcoma with giant-cell formation"; the third, an "active round-celled sarcoma": while the material removed from the affected area of the amputated limb showed "irregular necrotic areas, collections of inflammatory cells with numerous plasma cells and in one or two places masses of spindle-shaped fibroblasts." The radiographic evidence supplied in the article, whatever the diagnostic value of the original films, is unconvincing, for all the detail is missing. I have published in the journal from which the author quotes (*Proc. Roy. Soc. Med.* vol. 30, April, 1937) a number of cases of mistaken diagnosis of bone tumours. In one the clinical and histological evidence indicated a chondrosarcoma, but though the patient was not

treated with radiation nor amputation he made a complete recovery and sixteen years after is quite fit.

What makes me anxious is lest the treatment applied in this case should be copied for the treatment of any other case. Radiation from an X ray tube or radium may produce such an initial effect on an osteogenic sarcoma that its radiographic and clinical indications of malignancy disappear for a time; but experience shows that this good response is not maintained. More important still is the fact that if the intensity or duration of the radiation is increased in attempts to reproduce a similar response the patient may suffer from effects which are apparently more painful than the original lesion, though no cure is so produced. The patient, who may have strongly opposed the suggestion of amputation, now welcomes it as a means of relief from pain and dies within a few months from metastases. In this case we are told the patient desired amputation because he was tired of the pain produced by the radiation.

Clinicians are asking for earlier and still earlier diagnosis of malignant disease. The radiologist can sometimes give it, alas, before the clinical signs and symptoms are sufficient to arouse the patient's suspicions of its gravity and before the surgeon is sufficiently convinced to carry out radical surgical treatment.

In the treatment of osteogenic sarcoma early amputation is the treatment offering the only chance of cure, and any radiation therapy which masks the gravity of the lesion and checks the hand of the surgeon should be avoided.

I am, Sir, yours faithfully,

JAMES F. BRAILSFORD.

Edgbaston, Birmingham, Oct. 10th.

SPONTANEOUS HÆMOTHORAX

To the Editor of THE LANCET

SIR,—I read with interest the excellent summary of cases of hæmothorax described by Dr. Kenneth Perry in your last issue. I feel, however, that the ætiology of this rare condition is probably a little simpler than that suggested by him. A spontaneous pneumothorax as a result of rupture on an emphysematous bulla, and entirely unassociated with pulmonary tuberculosis or severe pulmonary disease of any kind, is not a rare episode. It is usually found in such cases that a considerable if not complete collapse of the lung results. Although as a rule adhesions are not present, it appears likely that in a certain proportion of cases adhesions might occur and if these should be vascular and should rupture as a result of a sudden pull of a collapsing lung then it is clear there is a considerable danger of the development of a hæmothorax. Thus the ætiology of hæmothorax becomes the ætiology of spontaneous pneumothorax.

I am, Sir, yours faithfully,

C. O. S. B. BROOKE,
Tuberculosis Officer, Metropolitan Borough of Finsbury.

Oct. 10th.

To the Editor of THE LANCET

SIR,—In June of this year I had under my care a young man with a spontaneous hæmopneumothorax. I have since had the literature of the subject under review and propose later to publish an account of this patient, since his case is made additionally interesting by the fact that a thoracoscopy was performed to attempt to demonstrate the cause. The term spontaneous hæmopneumothorax is elastic, and not all of the 46 cases analysed by Hopkins (*Amer. J. med. Sci.* 1937, **193**, 763) would need to be included if it were taken to mean that the hæmopneumothorax occurred in a person previously thought to be in good health. On the other hand, Dr. Perry says that 19 instances have been reported. He does not, for example, quote the typical case described by Troisier, Bariety, and Dugas (*Bull. Soc. méd. Hôp. Paris*, 1936, **52**, 84), nor the excellent account of the condition by Castex and Mazzei (*Pr. méd.* 1936, **44**, 2097). These articles are particularly important in a review of the subject since both of them demonstrate the presence of emphysematous bullæ. The case of Birch (*Brit. J. Tuberc.* 1936, **30**, 99) is even more important since, although it fits into a strict definition, a minute tuberculous cavity with roughening of the pleura was found post mortem.

I am, Sir, yours faithfully,

Norwich, Oct. 10th. S. T. FALLA.

BACTERIOPHAGE IN BACILLARY DYSENTERY

To the Editor of THE LANCET

SIR,—To me it appears strange that the value of bacteriophage in the treatment of bacillary dysentery, and allied conditions, in the United Kingdom is so slow of recognition. Thus, for instance, in his interesting article on bacillary dysentery in your issue of Oct. 1st (p. 796) Dr. Scott makes no mention of it. Yet in Egypt, particularly in the Alexandria region, its value in treatment has been so well established and is so generally recognised that the more enlightened of the general public, on the first signs of intestinal mischief—as evidenced by the appearance of frequent greenish mucoid stools in children, and blood and mucus in the adult—rush to the nearest pharmacy to procure either the bacte-dysenteri-phage (d'Herelle) or the bacte-intesti-phage (d'Herelle), and at once resort to their use, without waiting for medical advice. It is scarcely, I think, an over-estimate to say that frequently in 9 cases out of 10 the condition thus early taken in hand amounts to nothing, because of its being thereby quickly brought under control and rapidly cured.

One wonders, then, why our home authorities are so tardy in the recognition of an agent which has so fully and so dramatically established itself, in other parts of the world, as the most efficient of known therapeutic agents in the treatment of bacillary dysentery and allied conditions. An agent of such proved usefulness surely merits to be better known in the United Kingdom, more especially since Dr. Scott informs us in his opening sentence that bacillary dysentery is a common disease in this country.

I am, Sir, yours faithfully,

A. COMPTON,
Director, Municipal Public Health Laboratories, Alexandria, Egypt.

London, Oct. 10th.

HONORARY APPOINTMENTS FOR SALARIED PSYCHIATRISTS

To the Editor of THE LANCET

SIR,—I should like to protest against the growing practice of mental hospital superintendents applying for the posts of honorary psychiatrist at the teaching hospitals. These gentlemen are already in receipt of an income of £1000 to £2000 per annum with emoluments which are worth anything up to £500 per annum in addition. The attempt to obtain a teaching hospital post is therefore unnecessary. It is, however, more than this, since there are many of the younger men who have served long periods as clinical assistants in the psychiatric departments of the various hospitals and who have of necessity abandoned the security of the mental hospital services

to befit themselves to become consultants. The superintendent who obtains a teaching hospital post blocks these junior men from any chance of promotion to these posts. He obtains the consulting work merely as an addition to his already adequate income; or, if he is not allowed by his committee to do consulting work, he spoils a post which would provide another with consultations. It is exactly comparable with, for example, a medical officer of health applying for the post of physician to a teaching hospital. Again, if one is in charge of a large mental hospital it is impossible to provide the two or three half days a week necessary to work a modern clinic. As a result the work is scampered through in a few hours so that the patients are badly treated and the students are poorly taught. Moreover, there is a wealth of difference between the old-fashioned diagnostic psychiatry and modern psychotherapy. The mental hospital superintendent may be an expert at the former, which is sufficient when he is dealing with psychoses; but what of the psychoneurotic who is crying out for treatment? I am in no way hostile to the mental hospital physicians. They do a thankless job extremely well, but I do protest strongly against them obtaining the best of both possible worlds to the detriment of others.

I am, Sir, yours faithfully,

London, W., Oct. 8th. PSYCHIATRIST.

THE ARCHES OF THE FOOT

To the Editor of THE LANCET

SIR,—We have followed with considerable interest the correspondence which our communication on the arches of the foot has evoked, and we have to thank Mr. Bankart and the other writers for their letters. In justice to ourselves we must state that the paper was intended to present the results of our anatomical observations, and the clinical aspects were therefore of necessity dealt with very briefly. For this reason they are to some extent incomplete, and we find ourselves largely in agreement with Mr. McKee and Mr. Wiles so far as their additions are concerned.

We have no personal experience of either Lambrinudi's or Girdlestone's operations, but, as both are rationally planned, we can quite understand that Mr. McKee has found them effective. The slighter procedure has proved quite satisfactory in our hands, however, and occasion to use the more radical methods has not arisen in our cases of simple forefoot strain. Mr. Wiles criticises our view that stretching of the transverse ligaments of the metatarsal heads is the cause of pain in anterior foot strain, and we must agree in so far as this is only part of the story. The plantar ligaments of the joints are also stretched, and this, together with the fact that the transverse ligaments are attached to them, explains the site of the tenderness on the plantar aspects of the metatarsophalangeal joints. Passive flexion of the toes is also painful and this again is due to the strain which is then placed on the contracted structures on the dorsal aspect of the joints. But we are convinced that the stretching of the transverse ligaments is important, and we have frequently elicited pain by separation of the metatarsal heads, and we have generally found that pain is relieved by the approximation of the heads as by circular forefoot strapping. Mr. McKee takes us to task for the incomplete account of longitudinal flat-foot, and again we must plead that limitation of space is responsible. There is an intermediate stage in which radiological evidences of osteo-arthritis are wanting, and yet the foot is stiff and suitable for manipulation. We do not find that this constitutes anything like 90 per cent. of our cases of flat-foot; many of them also show clinical signs of arthritis, or have a history of trauma, or occasionally a mild toxic focus. In these cases we are accustomed to employ manipulation, generally with success.

These clinical considerations, however, did not constitute the main theme of our paper which is that the human foot possesses a well-defined structural longitudinal arch. We still cannot agree with Mr. Bankart that the mobility of the foot is the all-important factor, nor can we concede that the joints of the tarsus possess a "*wide* range of normal movement." Contrasting the tarsal joints with the other joints of the limbs it always has seemed to us that the foot, on the contrary, possesses a limited range of movement, and we feel that the essential modifications that are present in the human foot are such as to confer upon it a stability of structure which is not possessed by its earlier and freely moving prototypes. Making measurements on ten well-developed students, we found that the tuberosity of the navicular is on an average 2 inches above the ground, the minimum distance being $1\frac{3}{4}$ inches and the maximum $2\frac{1}{4}$ inches. If this represents the mid-position of the navicular, then, if we interpret Mr. Bankart's view correctly, the tuberosity should properly have the ability of passing through a distance of from $\frac{1}{2}$ to $3\frac{1}{2}$ inches above the ground. This wide range of movement would of necessity be associated with the ligaments on the plantar aspect of the foot being lax even in the mid-position, as ligaments are formed of fibrous tissue which is an inert substance devoid of contractile power. Such a condition of the ligaments in the weight-bearing position of the joints we feel is difficult to reconcile with an efficient stable unit. We do not imply that the foot should be rigid; when weight is borne upon the foot, it must to some extent yield and in a similar way it recoils when it is relieved of weight-bearing. The preservation of this range of movement is undoubtedly important for the functional efficiency of the foot.

Mobilisation, when these joints are stiff, is most assuredly effected by manipulation, and we are sorry that Mr. Bankart misreads us as believing that manipulation is contra-indicated, just as we are sorry that Mr. Bankart misreads as recommending valgus wedges, valgus pads, and exercises indiscriminately. These, of course, make the rigid foot worse and we are sure that this fact has not escaped the observation of previous British orthopædic surgeons; it is certainly the teaching that we ourselves received. The fact remains, however, that manipulation is employed to break down adhesions in the tarsal joints and *never* to flatten the longitudinal arch of the foot. We must in our turn apologise for having taken Mr. Bankart's previous statements about the absence of the arch too literally, although we must plead that both in his book and elsewhere he has been somewhat ambiguous.

We are, Sir, yours faithfully,

ROBERT WALMSLEY,
JOHN BRUCE.

University of Edinburgh, Oct. 11th.

DEMONSTRATIONS AT PAPWORTH.—Dr. Walter Pagel will hold two demonstrations at Papworth Hall, Cambridge, on Nov. 5th and 26th, beginning at 3 P.M. The subjects include the rôle of allergy in rheumatism and tuberculosis, and the anatomical basis of cavity healing. A discussion will follow each demonstration. Those who wish to attend should communicate with Dr. Pagel.

OBITUARY

SIR HENRY GRAY, K.B.E., F.R.C.S.E., LL.D.

AT the age of 68 Sir Henry Gray died on Oct. 6th in Montreal, where the later part of his life was spent. He was a man of strong personality and a surgeon of particular abilities.

The son of A. R. Gray, merchant in Aberdeen, Henry McIlree Williamson Gray was sent to Merchiston Castle School in Edinburgh and was its captain in 1888. He then went into business with his father, but after three years entered Aberdeen University as a medical student at Marischal College, graduating with honours in 1895. He became house surgeon to Sir Alexander Ogston, and had eighteen months in Germany and in London. Returning to Aberdeen he introduced the aseptic technique into the Royal Infirmary, where he was appointed assistant anæsthetist in 1897 and assistant surgeon in 1898. In the autumn of the following year he went out to South Africa as a civil surgeon and saw service with the South African Field Force before being invalided home with typhoid. Having meanwhile taken his Edinburgh fellowship he became full surgeon at the Royal Infirmary in 1904, and two years later joined the staff of the Royal Hospital for Sick Children. When the late war started Gray was well prepared for service by his work with the volunteers and territorials, and he went out to France in August, 1914, as surgeon to the British Red Cross Hospital at Wimereux. By November he had been appointed a consulting surgeon, serving first in the Rouen area and then, till June, 1918, with the Third Army. In this capacity he displayed, in a quiet way, remarkable energy and stamina. He organised his command, taught the latest facts and inferences, and saw that the methods he approved were carried out. "Quantity work" appealed to him. He was an advocate of the early excision of wounds wherever it could properly be done, and he developed and taught the technique. He had a natural flair for turning to surgical advantage the material that lay to his hand—the discarded container, for example. His mechanical bent was also evident in his methods of treating fractures: the time he spent on them, both in military and civil practice, before others were imbued and trained, was enormous. Some thirteen papers were published between 1915 and 1918 and Gray's "Early Treatment of War Wounds" published in 1919 is a valuable treatise. In August, 1918, now a colonel, he accepted the post of assistant to Sir Robert Jones in England. His services, both before and after the armistice, were recognised by four mentions in dispatches, and he was made C.M.G., C.B., and, in 1919, K.B.E.

Gray returned from the war to find his practice non-existent and his connexions gone. After a short time in Aberdeen and in London he accepted in 1923 the appointment of chief surgeon to the Royal Victoria Hospital at Montreal where it was supposed he would also, like his predecessor, occupy the chair of surgery at McGill University. This supposition was not fulfilled, and friction arose from the chair going to a man who was Sir Henry's junior at the hospital. In 1925, to overcome the difficulties of the situation, he consented to resign both from the university and from the hospital, and thereafter he practised privately in the city.

In Great Britain Gray was a pioneer in introducing local and spinal analgesia for major operations. He sought out everything new in surgical technique, and from his journey with the Moynihan Travelling Club he would always return with something fresh. At Aberdeen his influence remains strong, especially as four of his pupils are to-day members of the surgical staff of the Royal Infirmary. In the lecture theatre he did not shine, but during informal ward rounds, surrounded by perhaps a dozen students and without a specified subject, he was at his best. In this way he imparted to his followers the thoughts and theories of an original mind. At the time it was often difficult to assess the value of these talks, but later his pupils realised that his object had been to make them think for themselves, in which he succeeded admirably.

"As a chief," writes one of them, "he was sometimes very difficult. To quote his own words, 'the good enough is never good enough.' No excuse was ever accepted for the shortcomings of the unfortunate house surgeon. His language was forceful and he did not tolerate fools gladly. In spite of it all, his frequent broad grin and the twinkle of his kindly eyes peering through his spectacles calmed the troubled waters and once again we resolved to give of our best. He was also an excellent and understanding host. His Sunday evening suppers, attended by old and young, distinguished and undistinguished, will always remain pleasant memories for those who were privileged to attend them. Of the greatest value to the juniors were the informal talks which invariably followed. It would be impossible to estimate the pleasure Sir Henry derived from hearing his house surgeons argue with some of the most famous surgeons in the country. A man of outstanding ability and transparent honesty has passed on, but his influence will remain for all time with those who knew and loved him."

Gray was a good all-round sportsman and excelled as a fly-fisher. In his younger days he played rugby and cricket, in which he was a famous slow bowler. He wrote with difficulty, but by expenditure of much time became lucid and readable. He received the honorary degree of LL.D from Aberdeen in 1924. He married in 1897 Katherine, daughter of the late R. G. Rattray, and she survives him with a son and two daughters.

EDWARD COLLINGWOOD ANDREWS, M.D.Camb.

SON and father of Hampstead practitioners, Dr. E. Collingwood Andrews spent almost the whole of his life in the borough and was three times its mayor. He was born in London in 1862, was educated at University College School and took a science degree at London University before going up to St. John's College, Cambridge, as a scholar. Having secured a first-class in the natural sciences tripos he qualified

in 1885 from Guy's and became resident obstetrician there. He then joined his father, James Andrews, in practice in Hampstead and became keenly interested in the founding of the Hampstead Hospital, where he was one of the original honorary surgeons. A colleague writes of him as an ideal general practitioner —courteous, firm, and a wise physician, gaining the confidence and love of his patients throughout his fifty years of practice. Outside medicine he took a large part in the life of Hampstead; he was a member of the first Hampstead council, and at the time of his death was still an alderman, having received the freedom of the borough in 1935. His services were also sought by other public bodies, and he was on the council of University College School and of the North London Collegiate College for Girls. At one time he was also a keen volunteer, and for many years held a commission in the 19th Middlesex Royal Volunteers.

Dr. Andrews was twice married, first to Jane Tucker, and secondly to Alison Rowell, who survives him. He had three sons and a daughter by his first wife; two sons survive him, the youngest having been killed in the war.

FREDERIC HOLLAND THOMSON, M.B. Aberd., D.P.H.

Dr. Thomson, who died on Oct. 7th at the age of 71, had given the whole of his professional life to the study of infectious disease and the administration of fever hospitals. Seven years ago on reaching the age limit he retired from the North-Eastern Hospital which he had superintended for nearly thirty years.

Frederic Holland Thomson was an Aberdonian, the son of the Rev. W. Thomson. He qualified at Aberdeen in 1890, taking the D.P.H. three years later. On qualification he became assistant medical officer to the M.A.B. and began under John MacCombie his training in organisation and administration. His aptitude became apparent during his tenure at Gore Farm Hospital (1895 to 1904) where the small-pox epidemic of 1901–03 produced a difficult situation. For the next two years he was in charge of the Fountain Hospital and in 1906 was appointed to the North-Eastern Hospital, where he remained until his retirement from the service in October, 1931. In 1926 Thomson succeeded Foord Caiger as chief medical officer, but continued to administer his own hospital and to teach large classes of students and post-graduates. The stress was heightened by the death after prolonged illness of his wife and by the change-over from M.A.B. to L.C.C. Thomson worked loyally and unremittingly to make the change as smooth as possible; and these years exacted from him their toll, culminating in a cardiac attack from which he never fully recovered. With his colleague Caiger (and several others happily still with us) Thomson was a pioneer in evolving the modern fever hospital, to which our own columns in 1914–16 bear witness. Although he was not to plan or to see his own hospital reconstructed and enlarged with beds adequately spaced and ample chamber accommodation to reduce cross-infection, the design accords with the principles he advocated. Kindly, diffident, almost shy, a man of few words, Thomson made those few words tell, and he secured not only respect as a clinician, teacher, and administrator but an affectionate regard from his staff both medical and nursing. His terse and telling descriptions of disease are evident in a manual of infectious disease, but most of his writing is buried in official reports where their effect was as truly if less directly felt.

[*Photograph by Elliott and Fry*

A life of this kind left little time for recreation, but Thomson was a horticulturist of rare knowledge and enthusiasm with a special interest in rock gardening. During his long tenure at the North-Eastern he planted the grounds with many uncommon flowering shrubs and trees, and with may-trees in particular. Some of these succumbed to the rebuilding scheme, but even so the hospital grounds will long recall the man who planted and tended them, as he tended his human charges, with such skill and care.

FRANCIS CHARLES ABBOTT, C.B.E., M.S. Lond., F.R.C.S.

Mr. F. C. Abbott, who died on Oct. 6th in his 72nd year, was a surgeon of great promise whose career was cut short by failing sight. Born at Tottenham in 1867, second son of the Rev. A. R. Abbott, he was educated at Bruce Castle, and entering St. Thomas's Hospital secured most of the available prizes. After taking his B.Sc. in 1886, he qualified two years later, and in 1893 passed the M.S. Lond. at gold medal standard. He was in succession house surgeon, surgical registrar, and demonstrator of anatomy at St. Thomas's, and then obtained his first surgical staff appointment at the Evelina Hospital. In the Græco-Turkish war of 1897 he went out as chief surgeon to the *Daily Chronicle* fund for Greek wounded, where he was associated with H. J. Davis, R. Fox Symons, H. Moffat, and S. Osborn. He was happy in finding it simple and easy to apply antiseptic methods to military surgery. Although many of the gunshot wounds with which he had to deal had not received any first-aid they had not been tampered with in unfavourable surroundings. Röntgen's then novel discovery placed in his hands a new weapon for the detection of hidden bullets and Abbott contributed a striking series of radiograms to our columns. He held the view that X rays should be available at that hospital nearest the front in which the wounds could be first properly examined and dealt with; the apparatus was of no use on the field where the detection of bullets could only be an incentive to premature exploration. On his return he became assistant surgeon at St. Thomas's with special care of ears, and shortly afterwards lecturer on practical and operative surgery. In 1901 he married Pauline, third daughter of Col. L'Estrange of Moystown, King's County, and took a house in Welbeck-street. At this time he was active in the Chelsea Clinical Society, becoming a vice-president. But his fields of vision became steadily more restricted and courageously accepting the fact that he had retinitis pigmentosa he left London and took "The Hermitage," Bletchingley, where with his wife's collaboration he ran a successful clinic for neurasthenia. During the years 1914 to 1919 the beds at this and a neighbouring house were placed at the disposal of

the War Office and Abbott was commandant and surgeon-in-charge of Red Gables Hospital, being awarded the C.B.E. After the war he continued to make the best of what little sight remained to him and on visits to London alarmed his friends by hair-breadth escapes in crossing streets. He leaves his widow with two daughters.

THE LATE PROF. MACPHAIL

Sir Weldon Dalrymple-Champneys writes: "May I be permitted as an old friend and colleague of the late Prof. Alexander Macphail to add a short appreciation to the obituary notice in your issue of Sept. 3rd? I first met Macphail in 1912, when he had just become lecturer in anatomy at St. Bartholomew's Hospital and I had not yet begun studying medicine, but it was not until 1929 that I came to know him well. In that year I began to share a room with him in the Ministry of Health and continued to do so until his death. A more delightful colleague and companion cannot be imagined. In him I found that rare combination of refinement and gentleness with moral courage and on occasion righteous indignation, the whole illumined by a strong sense of humour. His religion was real and deep but never obtrusive and it was impossible to imagine him doing anything which savoured in the least of meanness or self-seeking. From his father, the well-known Gaelic poet of Mull, he had inherited a love of nature and artistic talents which showed themselves chiefly in the delightful water-colours, some of which he showed every year at the Ministry of Health's art exhibition. For some years he had suffered greatly from attacks of bronchitis which became more and more frequent, necessitating weary periods in bed, but he was always cheerful and uncomplaining and far more interested in other people's troubles than in his own. His death leaves a real gap in the lives of all who knew him well and to whom he was the personification of a Christian gentleman."

MEDICAL ART SOCIETY

ANNUAL EXHIBITION

THIS year the pictures are hung at the Rembrandt Gallery (5, Vigo-street, W.1) where they are well displayed, which means that the more capable works serve to lift the general level of talent. It is easy to see that the society flourishes and that art makes a strong appeal to the medical profession as a creative hobby.

Oils and water-colours this year are in about equal numbers. R. Hallam is almost the only artist who attempts to convey movement, and his impression of a "Point to Point" (19) gives a good idea of the dipping rhythm of riders. Like Degas, he is not afraid to cut off a horse's head by the frame, and the placing of the green cap of a jockey is an effective touch. Movement of a different order is to be found in T. H. C. Benians's "Hillside Ballet from the Train" (25), expressing the traveller's fancy of a plantation of young conifers being green-clad twirlers of the ballet. A. C. Dalzell's water-colour "Fantasy" (78), which is like an uneasy dream after a visit to an aquarium, exudes a fish-like rhythm. But the overwhelming taste is for calm, soothing landscapes, for Nature in her more placid moments.

The more notable pictures of this type among the oils are A. B. Hewlett's "Canal Lock" (5), sunny and making good use of the pattern of curved stonework; Helena Wright's "Lake Bohinska, Jugoslavia" (28), where the water is glimpsed through flecked tree trunks; C. A. Pannett's "Caragh Lake, Co. Kerry" (32), with its earthy tones and fleecy sky; Sir H. Gillies's "Winter Sun, Rye" (36), where the wind clearly has a nip in it; and H. W. Armstead's peaceful studies near Seaton (37) and at Rye (38). The slow-moving waters, calm fields, and clear skies among the water-colours are too numerous to list. They may be summed up in the title of W. A. D. King's leafy glade, "O Peaceful England" (44).

There are a few rebels among the lotus eaters, however. One is E. Davidson whose "Lyme Regis" (27) is so restless in design that one might almost suppose the R.A.F. had been having some bombing practice. E. R. Magill's "Aurland Fjord, Norway" (31) is a resolute attempt to portray dramatic scenery. And there is drama of a more subtle kind in Robert Worthington's two water-colours, "Vixen Tor, Dartmoor" (48) and "Stonehenge" (52). These are among the most enjoyable things in the exhibition, and in the latter there is more than a hint of Constable's "Stonehenge" at the Victoria and Albert Museum, in feeling rather than in actual design. In both, the immobility of the great grey shapes is emphasised by a freely moving sky and wisps of brighter colour. Another gifted water-colour artist is G. Bourne whose loose brushwork gives freshness to "Ruan Major" (41).

An oil painting in a class by itself is A. C. Dalzell's ambitious view of "The Valley of the Aude" (10). Here the artist's pre-occupation has been with the folds and structure of the hills and gorges. Yet the effect is decorative, and convincing artistically as well as geographically. E. F. Bebbington is a capable painter of still life, and shows two very natural domestic groups, that of kitchen produce (9) being the best. Flower studies are represented by C. Branwell's "Nasturtiums" (8) and Sir Leonard Hill's "Anemones" (18). The portraits by W. G. Barnard, E. Davidson, and K. Shirley Smith all have a good sense of character, but unhappily chosen backgrounds. L. Spira exhibits two pieces of sculpture of considerable charm. One is a group of three wild ducks in wood, knit together in a firm three-dimensional design. The other piece, a bronze, depicts the dejected servility of a street musician to a nicety.

The exhibition remains open from 10 A.M. to 6 P.M. until Oct. 29th. Admission is free.

A TRANSFUSION DEPÔT

IN time of war most able-bodied men would probably be prevented from acting as transfusion donors either by absence on active service or by lack of transport facilities. To meet this difficulty in London the British Red Cross Society is planning a bomb-proof emergency transfusion centre at Cheam, in Surrey, where blood may be collected and stored, and distributed to hospitals as required. On the outbreak of war, volunteers, most of whom would necessarily be women, would be asked to attend at the centre, about 200 being required every day, and their blood would be tested and grouped and placed in storage refrigerators. The hospitals would then telephone their requirements direct to the centre and the blood would be distributed in lorries. If the demand was fairly constant there would be no need for prolonged storage of the blood.

MEDICAL NEWS

University of Oxford

Dr. P. del Rio-Hortega will give two lectures this term on the histology of the nervous system. The subject of the first, to be given on Wednesday, Nov. 2nd, is the microglia at rest and in physiopathological activity; the second, on Nov. 9th, will be devoted to the classical neuroglia and the oligodendroglia. Both lectures will be held in the Nuffield Institute for Medical Research, Woodstock-road, Oxford, at 8.45 P.M.

University of Cambridge

At recent examinations the following candidates were successful:—

D.M.R.E.

Part II.—G. O. Chance, W. J. Craig, Theunis Fichardt, R. L. Mansi, A. M. Mansour, and C. G. Talwalkar.

University of London

At recent examinations the following candidates were successful:—

D.P.H.

S. N. Chelliah, A. L. St. A. McClosky, and A. B. Xuma.

University of Liverpool

At recent examinations the following candidates were successful:—

D.P.H.

S. Ball, A. Cathcart, and D. H. Williams.

University of Leeds

Dr. P. L. Sutherland, senior assistant medical officer of health and pathologist for the West Riding, and lecturer on the pathology of industrial diseases at the university, has been appointed to the chair of forensic medicine in succession to the late Prof. Maxwell Telling.

Clarke Hall Lecture

On Oct. 27th, at 4.30 P.M., in the hall of Gray's Inn, W.C., Lord Samuel will deliver the fourth Clarke Hall lecture. The title of his lecture will be Is the Criminal to be Blamed—or Society?

North Western Tuberculosis Society

Dr. G. Jessel will give his presidential address to this society at the Tuberculosis Offices, 352, Oxford-road, Manchester, on Thursday, Oct. 27th, at 3.15 P.M. He will speak on serial skiagraphy in pulmonary disease.

Chelsea Clinical Society

The annual dinner of this society has been postponed until Dec. 6th. An ordinary meeting, of which particulars will be found in our Medical Diary, will be held instead on Oct. 18th.

Ministry of Health

The Minister of Health has appointed Dr. Albert Edward Quine, a medical officer of the Ministry, to undertake the duties of inspector of anatomy in England and Wales.

St. Luke's Day

On Tuesday, Oct. 18th, St. Luke's day, at the church of St. Stephen, Walbrook, close to the Mansion House, at 1.25 P.M., Mr. W. McAdam Eccles, M.S., will give an address on St. Luke. The offertory will be devoted to the Royal Medical Benevolent Fund.

Society of Physiotherapists

The annual general meeting of this society will be held on Saturday, Oct. 22nd, at 2.30 P.M., at the Langham Hotel, London, W. The meeting will be followed at 3.45 P.M. by an at home at which Dr. E. P. Cumberbatch will address members and their friends on short-wave treatment.

National Physical Laboratory

Mr. C. G. Darwin, Sc.D., F.R.S., master of Christ's College, Cambridge, has been appointed to the directorship of this laboratory in place of Prof. R. H. Fowler, F.R.S., who has asked for reasons of health to be released from his engagement to assume the directorship on Oct. 1st. Until Dr. Darwin can take up his duties the office of director will be held by Sir Frank Smith, Sec. R.S.

Royal College of Surgeons of England

A series of demonstrations of specimens in the museum will be opened on Monday, Oct. 17th, when Dr. L. W. Proger will show new pathological specimens. He will give a further demonstration on Oct. 24th. On Oct. 21st Dr. A. J. E. Cave will demonstrate the anatomy of the mammary gland, and on Oct. 28th and Nov. 4th the anatomy of the female and male reproductive organs. On Oct. 31st Mr. R. Davies-Colley will show tumours of the kidneys. The demonstrations will be held at 5 P.M. at the College, Lincoln's Inn-fields, London, W.C., and they are open to medical practitioners and advanced students.

Royal Dental Hospital of London

School of Dental Surgery.—The twenty-ninth annual at home of this school will be held on Saturday, Nov. 26th. The morning, from 9.30 to 12.30, will be devoted to demonstrations at the in-patient department at Charing Cross Hospital and in the departments of the Royal Dental Hospital, where in the afternoon there will also be various exhibitions.

On the same evening at 7.30 P.M. the dinner of past and present students will be held at the Trocadero. Mr. F. C. Porter will be in the chair.

British Postgraduate Medical School

On Friday, Nov. 4th at 4.30 P.M., Dr. K. Blome, commissioner for post-graduate medical education in Germany and president of the International Academy for Postgraduate Medical Education, will lecture at the British Postgraduate Medical School, Hammersmith, on the organisation of post graduate medical education in Germany. In the department of surgery on Oct. 28th, Nov. 4th, and 11th at 2.30 P.M. Mr. G. C. Knight will lecture on the surgery of the sympathetic system. Applications for tickets for these lectures should be sent to the dean of the school, Ducane-road, London, W.12.

Medical Women's Federation

A dinner in celebration of the twenty-first anniversary of the federation will be held at the Criterion Restaurant, Piccadilly Circus, London, W, on Saturday, Oct. 29th, at 7.30 P.M. It will be followed by the presentation by members of the Manchester and District Association of a short play by Dr. Mary Sheridan. The dinner will be attended by medical women only and non-members will be welcome. Tickets may be had from the office of the federation, 9, Clifford-street, Bond-street, London, W.1.

Institute of British Surgical Technicians

Dr. Victor Goldman will deliver a lecture to this institute on the anæsthetist and his apparatus on Friday, Oct. 14th, at 8.15 P.M., at the Welbeck Hotel, Welbeck-street, London, W. Tickets will be issued to members of the medical profession free on application to the secretary, 6, Holborn-viaduct, London, E.C.1.

National University of Ireland

The senate of the university has awarded a travelling studentship in pathology to Dr. G. M. FitzGerald.

British Institute of Radiology

The twelfth annual congress and exhibition of this institute will be held on Dec. 7th, 8th, and 9th, at the Central Hall, Westminster. The Mackenzie-Davidson lecture will be given by Mr. G. Shearer, D.Sc., and the Silvanus Thompson lecture by Dr. R. Ledoux-Lebard. The annual dinner will be held on Friday, Dec. 9th, at Claridge's Hotel.

Pinsent-Darwin Studentship in Mental Pathology

An election to this studentship, which is of the annual value of not less than £225 and is tenable for three years, will be made in January. The student must engage in original research into any problem having a bearing on mental defects, diseases, or disorders, but may carry on educational or other work concurrently. Applications should be sent before Dec. 1st to the secretary, Pinsent-Darwin Studentship, Psychological Laboratory, Cambridge. No testimonials are required, but applicants should give the names of not more than three referees.

Lectures on Tropical Hygiene

A course of lectures on tropical hygiene for men and women outside the medical profession proceeding to the tropics will be given by Mr. H. H. Clay, Prof. R. T. Leiper, F.R.S., and Sir Malcolm Watson, at the London School of Hygiene and Tropical Medicine, Keppel-street, W.C., from Nov. 28th to Dec. 9th, at 4 P.M. Further information may be had from the secretary of the school.

International Cancer Week

L'Union Internationale Contre Le Cancer, which represents 52 nations, is holding an international cancer week from Nov. 23rd to 30th, and in connexion with this campaign an international congress to commemorate the discovery of radium, electrons, X rays, and hertzian waves will be held in Paris on these dates. The speakers will include O. Hahn and H. Stubbe (Berlin-Dahlem), De Hevesy (Copenhagen), G. P. Thomson and J. D. Bernal (London), M. von Laue (Berlin), Arnold Sommerfeld (Munich), Jacques Errera and L. Marton (Brussels), and F. Carter-Wood (New York). Further information may be had from the secretary-general, 18, Rue Soufflot, Paris V.

Course for Teachers of Mental Defectives

The Central Association for Mental Welfare has decided with the approval of the Board of Control to develop courses and establish a diploma for workers engaged in the teaching and training of low-grade mental defectives. The course will be held from January to December, 1939, and the first two terms will be spent in approved occupation centres. The third term will be spent in London and will consist of theoretical and specialised practical work. Further information may be had from the hon. secretary of the association, 24, Buckingham Palace-road, London, S.W.1.

Medical Diary

Oct. 17th to Oct. 23rd

SOCIETIES

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

TUESDAY.
5.30 P.M., general meeting of fellows.
Pathology. 8.30 P.M., Dr. G. W. Goodhart: Pathology and the Practice of Medicine. (Presidential address.)

THURSDAY.
Dermatology. 5 P.M. (Cases at 4 P.M.).
Neurology. 8.30 P.M., Dr. J. G. Greenfield: Cerebral Injuries. (Presidential address.)

FRIDAY.
Physical Medicine. 4.30 P.M., Dr. K. R. Collis Hallowes, Dr. S. Watson Smith, and Sir Henry Gauvain: Marine Therapeutics.
Radiology. 6.45 P.M., Dr. H. K. Graham-Hodgson: Radiology of the Mastoids. (Presidential address.)
Obstetrics and Gynæcology. 8 P.M., Dr. Howard C. Moloy (New York): The Influence of the Pelvic Architecture on the Mechanism of Labour.

HUNTERIAN SOCIETY.
MONDAY.—8.30 P.M. (Simpson's Restaurant, Bird-in-hand Court, 76, Cheapside), Mr. Andrew McAllister: The Influence of the Hunterian Era on Obstetrics. (Presidential address.)

CHELSEA CLINICAL SOCIETY.
TUESDAY.—8.30 P.M. (Hotel Rembrandt, Thurloe-place, S.W.), Mr. A. Rugg-Gunn: Contact Lenses.

SOUTH-WEST LONDON MEDICAL SOCIETY.
WEDNESDAY.—9 P.M. (Bolingbroke Hospital, Wandsworth-common), Dr. D. Evan Bedford: Functional or Organic?—Difficulties in the Diagnosis of Heart Disease.

BRITISH INSTITUTE OF RADIOLOGY, 20, Welbeck street, W.
THURSDAY.—8 P.M., Mr. W. E. Schall: British Radiology in the Future: (Presidential address.)
Medical Members.
FRIDAY.—5.30 P.M., case demonstration and discussion.

EUGENICS SOCIETY.
TUESDAY.—5.15 P.M. (rooms of the Royal Society, Burlington House, Piccadilly, W.), Dr. J. A. Fraser Roberts: Intelligence and Family Size.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

ROYAL COLLEGE OF PHYSICIANS OF LONDON, Pall Mall East, S.W.
TUESDAY.—4 P.M., Sir Edward Mellanby, F.R.S.: The State and Medical Research. (Harveian oration.)

ROYAL COLLEGE OF SURGEONS OF ENGLAND, Lincoln's Inn-fields, W.C.
MONDAY.—5 P.M., Dr. L. W. Proger: demonstration of pathological specimens.
FRIDAY.—5 P.M., Dr. A. J. E. Cave: Anatomy of the Mammary Gland.

BRITISH POSTGRADUATE MEDICAL SCHOOL, Ducane-road, W.
TUESDAY.—4.30 P.M., Dr. C. W. Buckley: Arthritis.
WEDNESDAY.—Noon, clinical and pathological conference (medical). 3 P.M., clinical and pathological conference (surgical). 4.30 P.M., Mr. F. G. Young, Ph.D.: Carbohydrate Metabolism.
THURSDAY.—2.15 P.M., Dr. Duncan White: radiological demonstration. 3.30 P.M., Dr. R. E. Roberts: Radiology in Obstetrics.
FRIDAY.—2 P.M., clinical and pathological conference (obstetrics and gynæcology). 2.30 P.M., Mr. G. Gordon-Taylor: Cancer of the Breast.
Daily 10 A.M. to 4 P.M., medical clinics, surgical clinics and operations, obstetrical and gynæcological clinics and operations.

ST. GEORGE'S HOSPITAL, S.W.
THURSDAY.—5 P.M., Dr. Anthony Feiling: neurological demonstration.

HOSPITAL FOR SICK CHILDREN, Great Ormond-street, W.C.
THURSDAY.—2 P.M., Mr. J. H. Doggart: The Control of Squint in Childhood. 3 P.M., Dr. Reginald Lightwood: Eumydrine in the Treatment of Pyloric Stenosis.
Out-patient clinics daily at 10 A.M., and ward visits at 2 P.M.

NATIONAL HOSPITAL, Queen-square, W.C.
MONDAY.—3.30 P.M., Dr. Macdonald Critchley: Aphasia.
TUESDAY.—3.30 P.M., Dr. J. Purdon Martin: The Cranial Nerves.
WEDNESDAY.—3.30 P.M., Dr. F. M. R. Walshe: clinical demonstration.
THURSDAY.—3.30 P.M., Dr. Gordon Holmes, F.R.S.: The Visual System.
FRIDAY.—3.30 P.M., Dr. Bernard Hart: The Psychoneuroses.
Out-patient clinics daily at 2 P.M.

CENTRAL LONDON THROAT, NOSE, AND EAR HOSPITAL, Gray's Inn-road, W.C.
MONDAY to SATURDAY.—Clinical course for part II of the D.L.O. examination.
FRIDAY.—4 P.M., Mr. Douglas Guthrie: The Physiology of the Vocal Mechanism.

HAMPSTEAD GENERAL AND NORTH-WEST LONDON HOSPITAL, N.W.
WEDNESDAY.—4.30 P.M., Sir Walter Langdon-Brown: Changing Conceptions of Disease.

LONDON SCHOOL OF DERMATOLOGY, 5, Lisle-street, W.C.
TUESDAY.—5 P.M., Dr. H. W. Barber: Psoriasis.
WEDNESDAY.—5 P.M., Dr. I. Muende: Histopathology of Common Skin Diseases. (Chesterfield lectures.)

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, W.
MONDAY to SUNDAY.—ST. JOHN'S HOSPITAL, 5, Lisle-street, W.C., afternoon course in dermatology. (Open to non-members.)—PHYSIOLOGY LECTURES FOR PRIMARY F.R.C.S., Mon., Wed., and Fri., 5.30 P.M.—CITY OF LONDON MATERNITY HOSPITAL, City-road, E.C., Sat. and Sun., course in obstetrics.—Unless otherwise stated, courses are open only to members.

LEEDS PUBLIC DISPENSARY AND HOSPITAL.
WEDNESDAY.—4 P.M., Mr. P. R. Allison: The Early Diagnosis of Some Common Chest Diseases.

MANCHESTER ROYAL INFIRMARY.
FRIDAY.—4.15 P.M., Mr. Geoffrey Jefferson: neurosurgical cases.

EDINBURGH ROYAL INFIRMARY.
THURSDAY.—5 P.M., Dr. A. Rae Gilchrist: The Rational Use of Digitalis and other Cardiac Drugs. (Honyman Gillespie lecture.)

Appointments

BALLANTINE, DUNCAN, M.B. Edin., F.R.C.S.E., L.M., Deputy Medical Superintendent at Alma-road Hospital, Rotherham.
CATES, BERNARD, M.B. Lond., D.P.M., Hon. Physician in Psychological Medicine to the St. John's Hospital, Lewisham.
GRAY, J. S. M., M.B. Glasg., D.P.H., County Medical Officer for Renfrewshire.
HAYES, D. S., M.R.C.S., Assistant Tuberculosis Officer for Manchester.
O'BRIEN, T. P., M.B. Dubl., L.M., Assistant Medical Officer at Oakwood Hall Sanatorium, Rotherham.
PREWER, R. R., M.R.C.S., Medical Officer, Class II, in the Prison Service.
ROWLEY, G. D., M.B. Edin., Resident Medical Officer at King Edward Memorial Hospital, Ealing.
YOUNG, FREIDA, M.B. Lond., Assistant Pathologist at the East Suffolk and Ipswich Hospital.

Hospital for Sick Children, Great Ormond-street.—The following appointments are announced:—
CATTERALL, R. C. F., M.B. Camb., F.R.C.S., Out-patient Surgical Assistant;
HUMBY, GRAHAM, M.R.C.S., Out-patient Surgical Assistant;
SMALL, H. A. D., F.R.C.S., Out-patient Surgical Assistant;

FINDLAY, L., M.B., Out-patient Medical Officer;
COLEBATCH, J. H., M.D. Adelaide, M.R.C.P., House Physician;
ELLIS, H. L., B.Chir. Camb., House Physician;
MANSFIELD, O. T., M.R.C.S., House Surgeon; and
MORGAN, EILEEN, M.B. Belf., House Surgeon.

Colonial Service.—The following appointments and promotions are announced:—

CREIGHTON, J. O., L.R.C.P., Medical Officer, Nyasaland;
HILL, WINIFRED M., M.B. Brist., Medical Officer, Zanzibar;
OAKES, R. L., M.B. Dubl., Medical Officer, West Africa;
OLIPHANT, J. S., M.B., Senior Health Officer, Sierra Leone; and
TURNER, J. G. S., M.B., D.P.H., D.T.M., Senior Health Officer, Nigeria.

Medical Referees under the Workmen's Compensation Act, 1925: Dr. W. I. A. FELL of Thurso, for the Wick Sheriff Court District (Sheriffdom of Caithness, Orkney, and Shetland). Dr. H. L. MACKINTOSH of Troon, for the Ayr Sheriff Court District (Sheriffdom of Ayr).

Examining Surgeon under the Factories Act, 1937: Dr. W. O. F. SINCLAIR (Saltley District, Warwick).

Vacancies

For further information refer to the advertisement columns

Aberdeen Royal Mental Hosp.—Jun. Asst. Physician, £300.
Altrincham General Hosp.—Sen. and Jun. H.S.'s, £150 and £120 respectively.
Belfast, Forster Green Hosp. for Consumption and Chest Diseases.—H.P., at rate of £150.
Birkenhead Municipal Hosp.—Sen. Res. M.O., £350.
Birmingham, Canwell Hall Babies' Hosp.—Res. M.O., £250.
Birmingham, Children's Hosp.—Pathologist, £600.
Brighton, Royal Sussex County Hosp.—Cas. H.S., £120.
Bristol Royal Infirmary.—Hon. Asst. Anæsthetist.
Buckinghamshire County Council.—Asst. County M.O.H., £500.
Central London Throat, Nose, and Ear Hosp., Gray's Inn-road, W.C.—Third Res. H.S., at rate of £75.
Chichester, Royal West Sussex Hosp.—Sen. H.S., £175.
Deal, Victoria Hosp.—Res. M.O., at rate of £200.
Dewsbury County Borough.—Deputy M.O.H. and Deputy School M.O., £600.
Doncaster Royal Infirmary.—Sen. Res. O. for Cas. and Out-patients' Dept., and H.S., at rate of £200 and £150 respectively.
Dorchester, Dorset Mental Hosp.—Jun. Asst. M.O., £400.
Eastbourne, Royal Eye Hosp., Pevensey-road.—H.S., at rate of £100.
Eastbourne, St. Mary's Municipal Hosp.—Res. H.S., £150.
Epsom County Hosp.—Res. Asst. M.O., £250.
Essex County Council.—Jun. Asst. M.O., £250.
Evelina Hosp. for Sick Children.—H.P., at rate of £120.
Guildford, Royal Surrey County Hosp.—H.P. and Cas. O., at rate of £150.
Halifax Royal Infirmary.—First H.S., at rate of £200.
Hammersmith Metropolitan Borough.—Deputy M.O.H. and Tuber. Officer, £750.
Hastings County Borough.—Deputy M.O.H. and Deputy School M.O., £650.
Hosp. for Consumption and Diseases of the Chest, Brompton, S.W.—Two Physicians.
Hosp. for Sick Children, Great Ormond-street, W.C.—Res. Aural Registrar, £150.
Hull Corporation Health Department.—Asst. M.O.H., £600.
Infants Hosp., Vincent-square, Westminster, S.W.—Hon. Anæsthetist.
King Edward Memorial Hosp., Ealing.—Con. Physician for Diseases of Children.
King's College Hosp., S.E.—Asst. Ophth. Surgeon.
Liverpool Eye, Ear, and Throat Infirmary.—Two Hon. Asst. Aural Surgeons.
London County Council.—Asst. Pathologist, £650. Asst. M.O.'s, Grade I, each £350. Also Asst. M.O.'s, Grade II, each £250.
London Hosp., E.—Clin. Asst. in X Ray Dept., £100.
London Lock Hosp., 283, Harrow-road, W.—Surg. Reg., £100.
London University, W.C.—Graham Scholarship in Pathology, £300.
Maida Vale Hosp. for Nervous Diseases, W.—Res. M.O., and H.P., at rate of £150 and £100 respectively.
Manchester, Withington Hosp.—Res. Obstet. Officer, at rate of £250.
Manchester Royal Children's Hosp.—Sen. M.O., £300. Also Asst. M.O. for Out-patient Dept., at rate of £150.
Manchester Royal Eye Hosp.—Out-patient M.O., £200.
Margate and District General Hosp.—Res. M.O., £150.
Metropolitan Hosp., Kingsland-road, E.—Second Gynæcologist.
Middlesex County Council.—Additional Asst. M.O., £800. Also Dental Anæsthetists, each 1½ guineas per session.
Norfolk Mental Hosp.—Asst. M.O., £350.
Norwich, Norfolk and Norwich Hosp.—Cas. O., £120.
Nottingham General Hosp.—H.S. to Orthopædic and Fracture Dept., and H.S. to Ear, Nose, and Throat Dept., each at rate of £150.
Plymouth, City General Hosp.—Jun. Asst. M.O., £250.
Preston County Mental Hosp., Whittingham.—Asst. M.O., £550.
Preston, Whiston County Hosp., near Prescot.—Res. M.O., £400.
Princess Louise Kensington Hosp. for Children, St. Quintin-avenue, W.—Physician in Charge of Child Guidance Clinic.
Radium Institute and Mount Vernon Hosp., 1, Riding House-street, W.—H.S., at rate of £150.
Royal Air Force.—Commissions.
Royal Cancer Hosp., Fulham, S.W.—Asst. Pathologist, £600.
Royal Eye Hosp., St. George's Circus, S.E.—Research Scholarship, £100.
Royal Naval Dental Service.—Dental Officers.
Royal Naval Medical Service.—M.O.'s.
Royal Tunbridge Wells, Kent and Sussex Hosp.—H.S. to Ear, Nose, and Throat and Ophth. Depts. and Res. Anæsthetist, £150.
Royal Waterloo Hosp. for Children, Waterloo-road, S.E.—Hon. Asst. Physician. Also Res. M.O., and H.P., at rate of £150 and £100 respectively.
St. Mary's Hosp., W.—Cas. H.S., at rate of £100.
Samaritan Free Hosp. for Women, Marylebone-road, N.W.—H.S., at rate of £100.
Sheffield Children's Hosp.—H.S., at rate of £100.
Southend-on-Sea General Hosp.—Res. Anæsthetist, at rate of £125.
Southern Rhodesia Medical Service.—Government M.O., £600.
Stafford, Staffordshire Mental Hosp.—Locum Tenens Asst. M.O., 7 guineas per week.
Staffordshire General Infirmary.—H.S., £175.
Stirling District Mental Hosp., Larbert.—Jun. Asst. M.O., £300.
Straits Settlements, Municipality of Singapore.—Two Asst. Health Officers, each $4800.
Swansea County Borough Mental Hosp.—Deputy Med. Supt., £525.
Swansea, Hill House Infectious Diseases Hosp.—Res. M.O., £350.
Ventnor, I.O.W. Royal National Hosp. for Consumption, &c.—Asst. Res. M.O., at rate of £250.
Warwick, King Edward VII Memorial Sanatorium, Hertford Hill.—Jun. Asst. M.O., at rate of £250.
Weir Hosp., Weir-road, Balham, S.W.—Sen. Res. M.O., £250.
West Ham County Borough, Education Dept.—Sen. School Dental Officer, £550.
West London Hosp., Hammersmith, W.—Res. Chief Asst. to Dept. for Treatment of Injuries, £200.
Willesden General Hosp., Harlesden-road, N.W.—Asst. Surg. O., £50.
Worcester County and City Mental Hosp., Powick.—Asst. M.O., £350.
Worcestershire Mental Hosp., Barnsley Hall.—Second Asst. M.O., £350.

The Chief Inspector of Factories announces vacancies for Examining Factory Surgeons at Wimbledon (Surrey), Bournemouth (Hants), and Church Stretton (Shropshire).

Births, Marriages, and Deaths

BIRTHS

BANKS.—On Sept. 28th, at 56, Gwney-drive, Hampstead Garden Suburb, N.2, the wife of Dr. A. Leslie Banks—a son.
BERGH.—On Oct. 3rd, at Staines, the wife of Dr. Henry Bergh—a daughter.
BORHAM.—On Oct. 2nd, at Southwold, Suffolk, the wife of Dr. John Borham—a daughter.
DAY.—On Oct. 4th, at Courtfield-gardens, S.W., the wife of Capt. P. T. L. Day, R.A.M.C.—a son.
DIXON.—On Oct. 2nd, at Braintree, the wife of Dr. J. H. Dixon—a son.
GENENA.—On Sept. 6th, at Heliopolis, Egypt, the wife of Dr. M. N. Genena—a son.
GOLDBY.—On Oct. 7th, at Adelaide, S. Australia, the wife of Dr. Frank Goldby—a son.
KERBY.—On Oct. 7th, at Collingham-gardens, S.W., the wife of Dr. T. R. F. Kerby—a son.
SLESINGER.—On Oct. 3rd, the wife of Mr. E. G. Slesinger, F.R.C.S., of Devonshire-place, W.—a son.

MARRIAGES

DAVISON—HOPE.—On Oct. 8th, at the Church of St. Mary the Virgin, Norton-on-Tees, George Davison, M.D., to Maud Hope.
HENDERSON—ERREN.—On Oct. 6th, at St. Ethelburga's Church, Bishopsgate, Archibald Henderson, M.B., to Rosalie Mercy Erren.
MATTHEWS—GILL.—On Oct. 1st, Lieut.-Colonel Edgar William Matthews, T.D., M.B., to Alice Gill.
MORRIS—ORR-PATERSON.—On Oct. 5th, at Magheramena, Belleek, E. W. T. Morris, F.R.C.S., to M. I. Orr-Paterson.
SMART—FRAMPTON.—On Oct. 6th, at Bromley, Kent, Joseph Smart, M.R.C.P., to Phyllis Mary Frampton.
WHITTERIDGE—HUTCHINGS.—On Sept. 28th, at St. Stephen's, Norbury, David Whitteridge, M.B., to Gweneth Hutchings, M.A., D.Phil.

DEATHS

ABBOTT.—On Oct. 6th, in London, Francis Charles Abbott, C.B.E., M.S. Lond., F.R.C.S., of Bletchingley, Surrey.
ANDREWS.—On Oct. 7th, at Hampstead, Edward Collingwood Andrews, M.D. Camb., aged 77.
GIBB.—On Oct. 11th, J. Aldington Gibb, M.D. Aberd., of Maidstone.
GODSON.—On Oct. 3rd, at Beaconsfield, Alfred Henry Godson, M.B. Camb., F.R.C.S., aged 72.
GRAY.—On Oct. 6th, in Montreal, Sir Henry Gray, K.B.E., F.R.C.S.E., aged 68.
JORDAN.—On Oct. 5th, Lieut.-Colonel J. G. Jordan, I.M.S. (retd.), of Barons Court-road, W.
LOWIS.—On Oct. 2nd, at Parkstone, Dorset, Horace Lake Lowis, O.B.E., M.B. Edin.
MCHUGH.—On Oct. 4th, James F. McHugh, M.B. St. And., late of Luton, Beds, and Chatham.
STOOPS.—On Oct. 9th, at Wembley Park, William Alexander Stoops, M.B., R.U.I., formerly of Leeds.
THOMSON.—On Oct. 7th, at North Finchley, N., Frederic Holland Thomson, M.B. Aberd., D.P.H., aged 71.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.

NOTES, COMMENTS, AND ABSTRACTS

THE DOCTOR'S CAR

BY FRANCIS H. KELLY, M.B.

MOST doctors nowadays use the same types of car as the rest of the community, but this may be from necessity rather than choice. For the doctors who employ a chauffeur the ordinary saloon or limousine is well suited; those who drive themselves have different needs and if agreement can be reached on these the demand may well induce manufacturers to provide for their satisfaction. At present there is no car on the market on which all the features set out below are to be found; but only one thing is suggested which is not supplied on some car.

The first requirement of a doctor is, I think, *durability*. There is one simple way to provide an engine that will last longer—to fit a larger engine in a small car. Such an engine is under far less stress because it is working well within its limits. It could also be made with a lower compression ratio so that decarbonising should not be necessary more than once in every 20,000 miles. If I were pressed for figures I should say that the engine should have a capacity of about 2 litres, and the whole car should not exceed one ton in weight. To demand an engine nearly double the size of one which would do the work may be thought extravagant, and economy is for most of us a matter of supreme importance. Certainly the owner of such a car as I suggest will have to pay a larger tax; a higher insurance premium—it is difficult to see why—and a little more money for petrol. The difference in petrol consumption should not be large, for the weight of the car and the use made of speed and acceleration are the important factors in determining it. But the larger engine would require less attention during its life than the more "fussy" small one, and the greater durability would postpone that heaviest of all expenses, the exchange of an old for a new car.

Another factor with an important bearing on durability is the maintenance of the engine at the right temperature (a little short of the boiling point of water) whenever it is running. This is especially difficult to achieve in a doctor's car because the frequent and sometimes prolonged stops let the engine get much too cold. Of the various devices for keeping up the temperature I prefer radiator shutters, controlled by hand, which can be closed every time the car stops. Many drivers, however, dislike having to attend to such things and thermostat control of radiator shutters or of water circulation suits them better. In any case an engine thermometer which registers on the fascia board is most desirable.

Easy starting.—Some cars are advertised now as having a particularly low petrol consumption, so it may be worth while to refute the commonly held notion that this may be associated with difficulty in starting from cold. Easy starting depends on a good spark at low engine speed, and a specially rich mixture obtained by some kind of strangler device which is released when the engine gets going. The chief reason for the improved petrol consumption in relation to their performance of modern cars is that the increased compression ratio used makes their engines more efficient. Practically all up-to-date cars start well from cold if they are in good order.

Trouble-saving devices.—Next in importance we may place comfort, by which I mean anything that makes the car easier to maintain, or more pleasant to drive. My personal choice is for independent front wheel springing and high-geared steering, but neither of these is of outstanding importance to a doctor as such. A good steering lock is certainly desirable for a practitioner whose work takes him through narrow streets or lanes. The Wilson type of self-changing gear-box with automatic clutch or fluid flywheel, fitted to Armstrong-Siddeley, Daimler, and Lanchester cars, is undoubtedly convenient, but it adds to the weight and initial cost of the car. The synchromesh gear-box fitted on most cars varies considerably in the ease with which it permits change of gear. In the better models gear changing (except to bottom gear) is hardly more difficult than with the Wilson box. A really efficient central lubrication system saves trouble, but is not to be found on any cheap car.

A useful accessory is some form of built-in jack, though punctures are so few nowadays that what formerly would have been the greatest boon is now somewhat of a luxury. One technical point worth mention is compensated voltage control—an arrangement which automatically prevents the dynamo from overcharging the battery. This is hardly likely to happen on a doctor's car, but to him this device has the special advantage that it enables the dynamo to be set so that it can charge at a higher rate than would otherwise be safe. The battery has thus a relatively longer life and will rarely be run down even by the frequent starting to which a doctor's car is subjected. Compensated voltage control is fitted on most cars nowadays, but is still lacking from some of the cheaper ones.

The *ground clearance* on many cars has been cut to a minimum, and if the practice involves travel on very deeply rutted lanes and cart-tracks this point should not be overlooked. One bad scrape can do much damage.

The *design of the body* is of great moment. My view is that the best type of body, if the doctor wants his car only for work, is a two-seater drop-head coupé. There are probably few drivers of saloon cars who would not like to have the roof removed occasionally if it could be done without trouble. This drop-head type of body is obtainable on very few cars, most of them rather expensive. If there were sufficient demand for it it could be made as cheaply as the popular saloon which is bought by many people only because it is the cheapest type of body. The two-seater drop-head coupé is relatively light in weight—it is the only "open-closed" body of which the top can be raised or lowered from the driving seat in a few seconds and it allows easy vision backwards through the rear window for reversing. The four-seater drop-head coupé is heavier, the top is more troublesome to raise or lower, it has a poor view backwards because the small rear window is far from the driver, and it has large clumsy doors.

A doctor, who has to get in and out of his car often, needs a moderately high seat, a fairly upright back, and plenty of head room. He should be able to use either door with equal ease and not have to climb out on the offside in the path of oncoming traffic. Makers are beginning to remove hand-brake levers out of the way (sometimes so much out of the way that they are inaccessible), but gear levers still obstruct

passage, except in cars fitted with the Wilson gearbox and one or two others with special types of gear control. Bucket seats should be discarded; they are not specially comfortable to sit in and they add considerably to the difficulty of getting in and out from the near side. Pivoting glasses in front of the ordinary vertically winding windows protect the driver from draught and prevent condensation on the windscreen when the car has to be closed. As regards upholstery leather is durable, but polishes clothes; cloth does not wear so well, but saves coat and trousers; imitation leather combines the faults of both and should be avoided, if possible.

A few cars have a cubby hole with a lid which will lock, but I do not know of any with a locking compartment large enough to contain a doctor's impedimenta which can be opened from inside the car. Such a compartment would be easy to arrange behind the seats of a two-seater coupé.

Visibility.—Much of the fatigue of driving nowadays arises from mental rather than physical strain. Some of this is inevitable and some can be avoided by care for physical comfort. One cause of nervous strain not generally recognised is the poor visibility obtained from the low-built boxed-in modern cars. In order to have a clear and safe view of the road the driver must be able to see both front wings without moving and the screen pillars must not exceed in width the distance apart of the driver's eyes. To those with binocular vision such pillars present no obstruction at all. A high roof line may not make driving any easier, but gives a sense of spaciousness and removes the feeling that something is pressing down on one's head. Lastly, though a screen which will open to give a direct view of the road is very seldom needed it may on occasions be needed very badly.

THE LEGACY OF THE BOUNTY

PITCAIRN ISLAND, which is only 1½ miles long, was settled in 1790 by nine mutineers from the *Bounty*, six Tahitian men, twelve Tahitian women, and a little girl. Though the inhabitants have twice been evacuated, in 1831 and 1856, all but 9 of the present population (209 in 1936) are native islanders and presumably descendants of the mutineers. Last year Mr. J. S. Neill, a civil servant, and Dr. Duncan Cook, medical officer of health for North Auckland, New Zealand, spent 39 busy days at Pitcairn, and their reports,[1] issued by the Colonial Office, make fascinating reading.

Mr. Neill is concerned chiefly with the laws, education, and maintenance of the people—this last depending largely on the export of oranges to New Zealand and the sale or barter of fruits, baskets, and curios to ships. About 50 vessels now call each year, but in bad weather the journey from shore to ship is perilous, and the islanders have had to acquire much skill in seamanship. Physically they are very strong and their intelligence is not low by European standards; but the Pitcairnese dialect of English is becoming less and less intelligible, and the school, conducted by four untrained island teachers, imparts little knowledge and secures poor discipline. As for the adults, the contemporary loosening of sexual codes has not left even Pitcairn unaffected, and the birth-rate for this or other reasons is falling, though apparently "contraception is not a factor of importance," and there is very little venereal disease.

As half-castes, the islanders have been lucky in their isolation, having no social or economic prejudices to contend with, and there is no sign of physical or mental degeneration from in-breeding. The people and their life present a curious mixture of two races and cultures: the public work of the community, the agricultural methods, and most of the food is Polynesian, and so is the environment; "the drift," Mr. Neill says, "will be Polynesian without Polynesian discipline, unless the educational system is placed on a proper footing." On the other hand, the houses and their furnishing are English, the dog is the friend of the family, and since 1836 the people have been Seventh Day Adventists subscribing much of their income to foreign missions, though they often expect the government to pay for their own urgent needs.

The vegetarian tenets of this sect increase the difficulty of securing enough good food, and though some goats are shot and some tinned meat imported Dr. Cook thinks there is a serious shortage of animal protein—especially as there are no cows, the goats are not milked, the hens' eggs seldom reach the table, and shell-fish and crayfish are banned for religious reasons. The soil, which is fertile and often 20–30 feet deep, is never trenched or enriched, and unfortunately the islanders, like many other people elsewhere, increasingly find profit in activities requiring little work, such as the harvesting of oranges and the making and selling of souvenirs for ships. Agricultural neglect would have serious consequences if the ships ceased to call, and the conservatism of the people ought to be overcome by teaching; but critics of the diet cannot help being impressed by the excellent physique and health of the average islander—possibly attributable to large consumption of the many fruits at his elbow. The one striking defect is early dental decay, partly, no doubt, induced by deficiencies in the food consumed, but partly also by its softness. The teeth are covered at all times with a soft, starchy film which nobody attempts to remove with a tooth-brush.

[1] Pitcairn Island. Colonial Office Report. No. 155. London: H.M. Stationery Office. Pp. 79. 1*s.* 3*d.*

A STUDY OF LONGEVITY

THE chances of becoming a centenarian appear to vary greatly in different countries though the figures may be vitiated by the lack of accurate records of birth a hundred years ago. According to Basilievitch and others,[1] the number of centenarians per million of the population is 12 to 13 in Norway, 5 to 6 in Denmark and Italy, 1·4 in Germany, and only 0·6 in Czechoslovakia, while the rate in the R.S.F.S.R. is 125 and the highest figure (3792) is reached in the Abkhasian Autonomous Republic of the Georgian S.S.R. An exhaustive study has been made of twelve Abkhasian men, whose ages are said to range between 95 and 142. Clinically, the most obvious changes were atrophy of the skin with pigmentation, loss of fat, hypotonicity of muscles, and atrophy of the genitalia. A radiological study revealed pronounced atrophy of the jaw, even when many teeth remained, kyphosis due to changes in the intervertebral discs, no osteoporosis and only slight decalcification of bones, and little evidence of calcification of the costal cartilages. Though the arteries were lengthened and tortuous, very little calcification was found in them. Renal function was evidently unimpaired, for the specific gravity of the urine was normal and there was no nitrogen retention in the blood. The blood pressure exceeded 160 mm. in only three cases, being 170, 180, and 200 mm. An investigation of the special senses revealed slight impairment of vision, mainly due to opacity of the lens, and more marked loss of the sense of smell and of hearing, especially for high tones. The basal metabolic rate was low. The only abnormality observed in the course of biochemical investigation of venous blood was an excess of calcium over potassium. Blood counts showed polycythæmia in one case only; six men gave counts of between 4 and 4·5 million red cells per c.mm., and the remaining five were distinctly anæmic. The hæmoglobin estimation followed the red cell count, giving a normal

[1] Basilievitch, I., Turovetz, I., Gragerova, R., and Mizrukhin, I., *J. méd.* (Kiev), 1938, **8**, 7.

colour-index throughout the series. Most of the subjects showed a polymorph leucopenia. The erythrocyte sedimentation-rate was much raised, but no data are given to show whether this was due to the anæmia. Anthropometric, neurological, and psychological data are also given. In spite of their great age these men were capable of leading an active life without undue fatigue and their memories were remarkably clear. The general conclusion drawn was that the physiological process of senility had affected equally all the organs and had not been influenced by any chronic disease other than malaria. Evidence of tuberculosis or rheumatism was entirely lacking.

FRUITS AND THEIR VITAMIN CONTENT

THE Royal Hungarian Office for Foreign Trade has brought out a booklet containing life-size coloured photographs of the types of fresh fruit exported from that country. Information given about each fruit includes the percentage content of sugar, of acid, and of total edible dry substance, the content of vitamin C being stated in so many milligrammes per 100 grammes. A few of the values are somewhat outside the range given for the same fruits in the vitamin tables published in this country,[1] but the analytical data are based upon tests extending over four years at the Royal Hungarian National Chemical Institute and are vouched for by Prof. L. Beke.

A THEORY OF CHOICE IN LOVE

IN an essay designed for psychologists, L. Szondi,[2] a Hungarian genealogist, makes a contribution to what he calls "fate analysis." The hand of fate, he holds, may work invisibly but if we follow the life of an individual something like a definite plan generally emerges. In what phenomena of life will the structure of such a plan manifest itself most clearly? In Szondi's view it will show in the individual's choice of what he loves, desires, imitates, and idealises; in his choice of a profession; and even in the diseases from which he suffers and in the cause of his death. This introductory paper deals only with choice in love. Is it possible that the hidden ancestors, the repressed recessive genes, are the fatal force which leads lovers to their choice? The author was led to formulate the hypothesis that this force is potent, observing the case of a man whose wife developed the same neurosis as his own mother. His belief in it was strengthened by some subsequent genealogical investigations in the course of which he met with a number of marriages between individuals carrying similar recessive genes. Analysing these marriages, he divides them into three groups. First a rare group of what may be called "concordant marriages"—those occurring between persons suffering from the same hereditary taint; secondly, a much more numerous group of "discordant marriages"—those between a healthy person and one afflicted with a hereditary defect, the same defect being traceable in the healthy partner's ancestry; and thirdly, a group of marriages between two healthy people in whose ancestry or progeny, if any, however, the same or some closely related hereditary disease could be demonstrated. The healthy partners to these marriages could be proved on Mendelian theory and evidence to be heterozygotes or hybrids and they carried in latent form the same hereditary trait as their mates. If these latent recessive genes were effective—had not in fact given up their valence—at the time that the love declared itself (and this is not at variance with modern genealogical concepts) they might well in his view be the determining biological factor in the choice of a mate. Szondi believes that the final proof of this theory must rest upon certain statistical calculations for which enough data are not yet available. Lacking these, he cites as examples supporting his view cases of one person marrying a succession of mates all having recessive genes similar to his own, and cases of marriage between blood relatives and of rape and incest which occur despite strong social taboos. Totemism imposes a more far-reaching taboo in that it forbids marriage inside the totem clan—a primitive attempt to prevent, by means of severe penalties, what may be called tribal or "gene-incest" towards which, according to the author, there is a strong urge. He finally draws the conclusion that all love is essentially incestuous in that it is directed towards a gene-relative. In civilised society direct blood incest is forbidden and gene-incest remains as a substitute. According to this idea it is on the ability of individuals to adjust themselves successfully to this compromise that their happiness in life in great measure depends.

[1] *Nutr. Abstr. Rev.* 1938, **7**, 845.

[2] Contributions to Fate Analysis. I—Analysis of Marriages: An attempt at a Theory of Choice in Love. Republished from *Acta psychol.* 1937, **3**. By Martinus Nijhoff. The Hague.

RULES OF HEALTH

ON leaving school every Scottish boy and girl will be presented with a copy of "The Rules of Health," an attractively printed booklet issued jointly by the Department of Health for Scotland and the Scottish Education Department. The rules are set out in six short paragraphs under the headings "Fresh Air and Exercise," "Rest," "Food," "Care of the Body," "Medicines," and "Care of the Mind," and, with the possible exception of the advice to sleep with the mouth shut, appear simple enough to obey. Much wisdom is summarised in these few pages and the doctor may most welcome the injunction, "Don't always *expect* to get a bottle of medicine when you go to your doctor." The booklet ends with a few words on the Scottish health services and medical benefit.

AUSTRIAN MEDICAL STUDENTS

Mr. J. H. Humphrey, hon. secretary of the Medical Advisory Council, University Labour Federation, 37, Great James-street, W.C.1, writes as follows: "We should like publicly to express our sincerest sympathy with our fellow medical students of Austria who find their careers, and perhaps their lives, in danger as a result of the incorporation of their country in the German Reich. Their crime is this: that they have too openly criticised the totalitarian régime; that they are Roman Catholics; or that they have Jewish blood in their veins. The London Hospital has given a free place to one such student whose maintenance has been guaranteed. The Austrian Self-Aid, of 89, New Oxford-street, W.C.1, can supply the names of other students.

"Unless other medical schools will follow the generous example of the London, these students are condemned to be useless members of the community which they had meant to serve."

DISCLAIMERS

Dr. Dennis Embleton, as a result of press publicity for a paper published in the *Proceedings of the Royal Society of Medicine*, has received many letters from diabetics who have been led to suppose that he thinks the use of insulin no longer necessary. He made no such claim. His paper, which was briefly reported in our issue of June 4th, emphasised the value of dieting to diabetics over 40 years of age.

Sir Harold Wernher, chairman of the Voluntary Hospitals Emergency Bed Service, writes: In order to give a realistic impression of our work the B.B.C. broadcast the Emergency Bed Service end of an actual conversation with a doctor from the London Regional station last week. Unfortunately, and quite unintentionally, the name of the doctor was also broadcast. On behalf of the doctor I should like to make it clear that he was not aware that his name would be broadcast and would certainly not have permitted this.